FIG. 1

FIG. 2

FIG. 3

264a {
275a
274a
273a

272a
271a

262a

260

271b
272b

264b

261

262b {
273b
274b
275b

FIG. 4A

266   266

264a {

272a
271a

260   267   260

FIG. 4B

268a

270a {
285a
284a
283a

264a {

285b
283b
284b

268b

270b

FIG. 4C

286

270a

264a

262a

FIG. 4D

286   290

264a

266   290

FIG. 4E

292   286   292
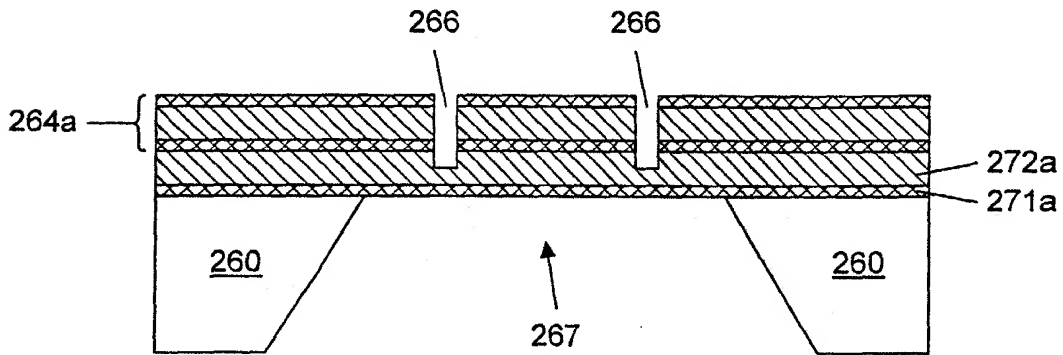
266

FIG. 4F

FIG. 5

alizarin complexone

o-cresolphthalein complexone

5-carboxy fluorescein

FIG. 6

FIG. 7

FIG. 8
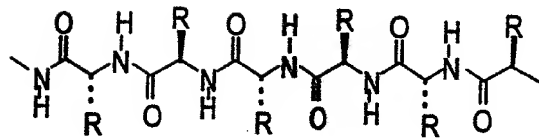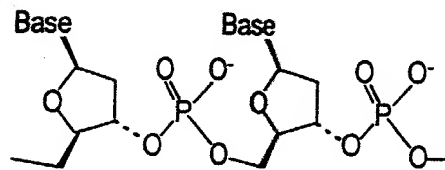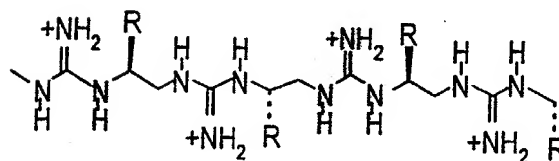
FIG. 9

Peptides
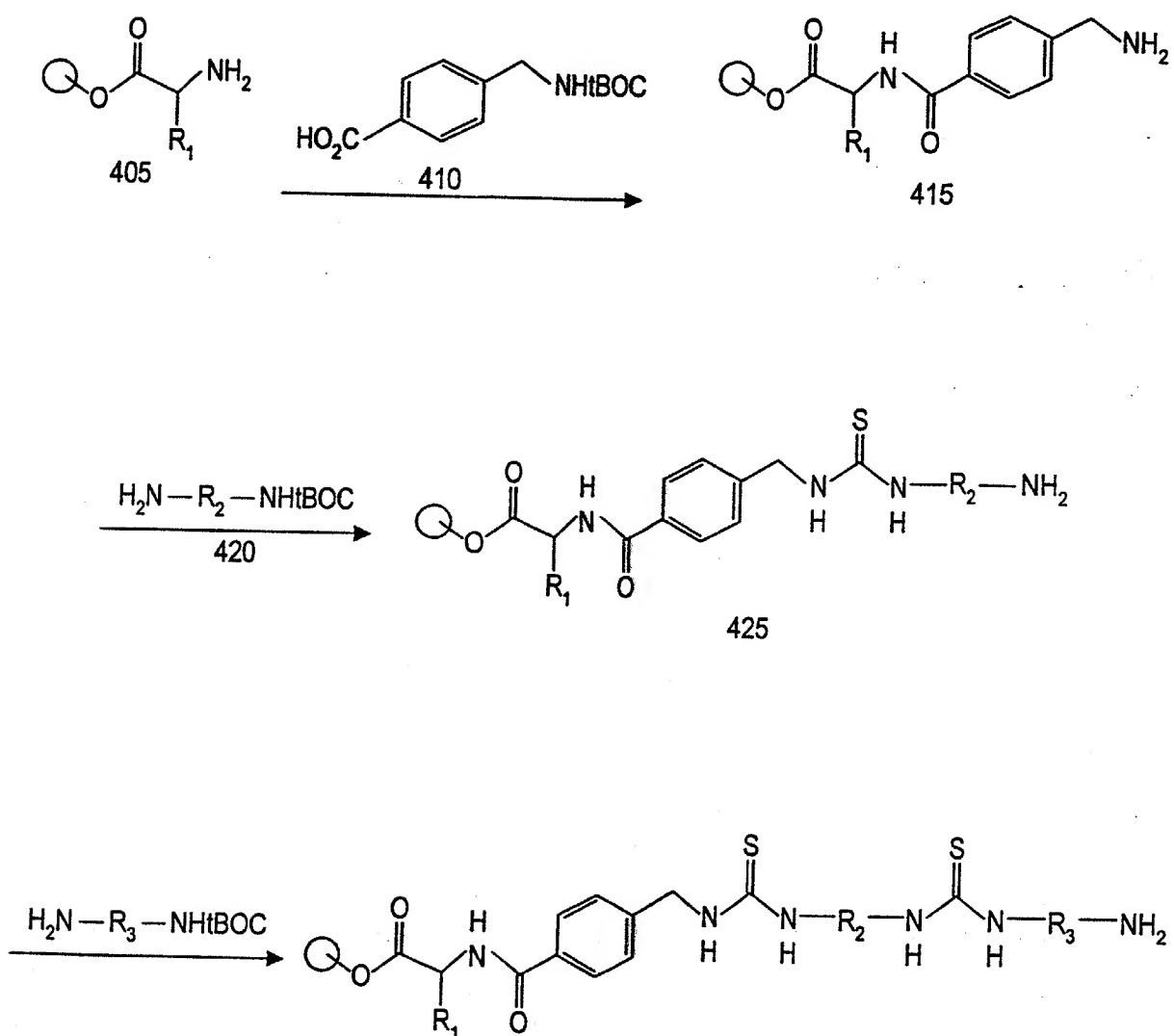
Nucleotides

Polythioureas

Polyguanidiniums

FIG. 10

FIG. 11

FIG. 12

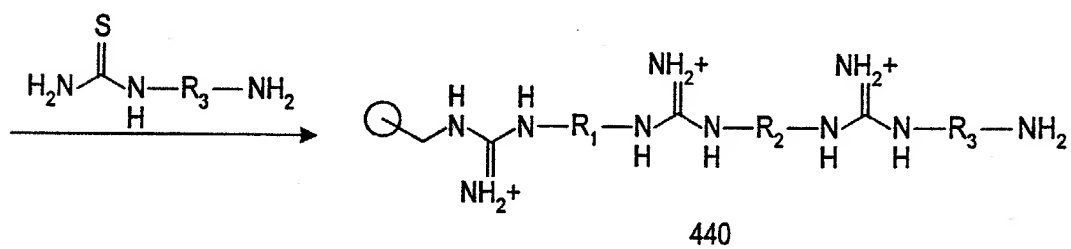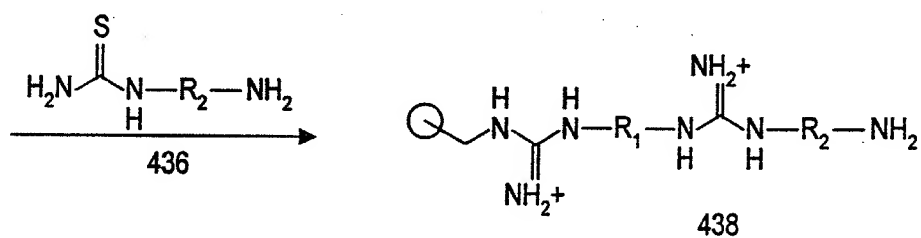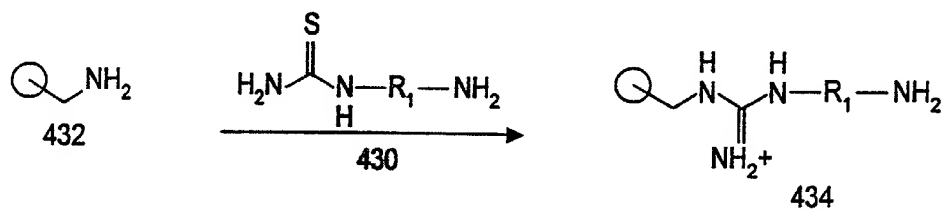tBOCNH — CO₂H → BH₃/THF → tBOCNH — CH₂OH

$$tBOCNH-\underset{R}{CH}-CO_2H \xrightarrow[THF]{BH_3} tBOCNH-\underset{R}{CH}-CH_2OH$$

450

452

$$\xrightarrow[PPH_3 / DEAD]{}$$

$$tBOCNH-\underset{R}{CH}-CH_2-N(phthalimide) \xrightarrow[H_2O]{CH_3NH_2} tBOCNH-\underset{R}{CH}-CH_2NH_2$$
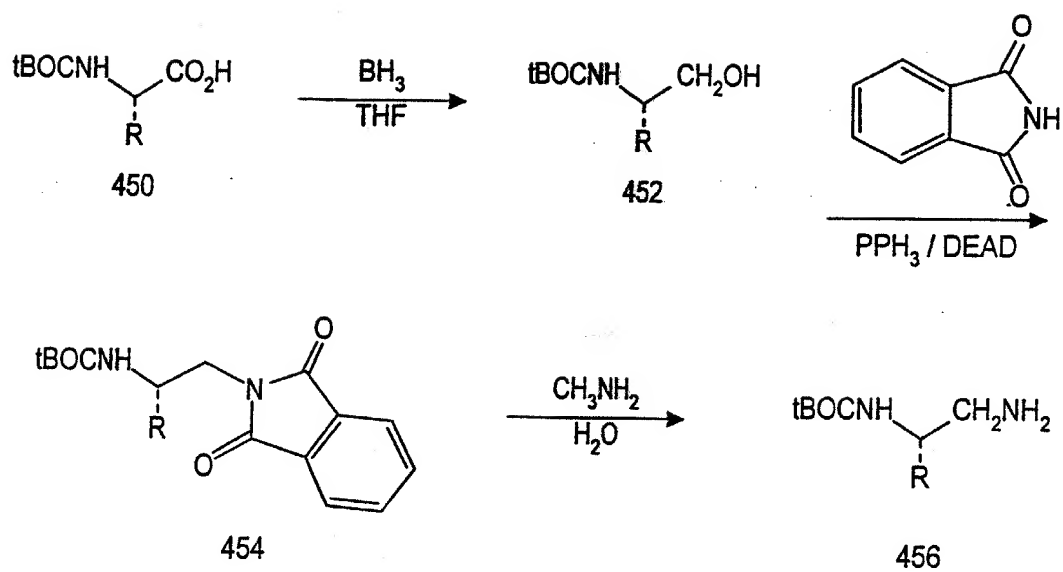
454

456

FIG. 13

470

475
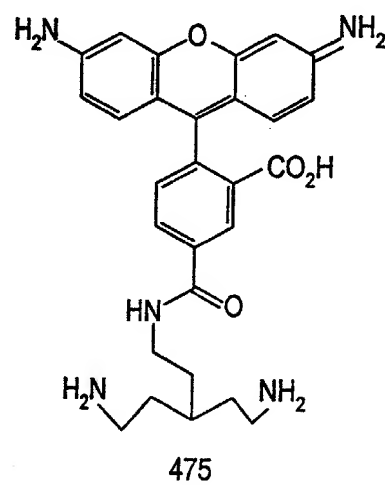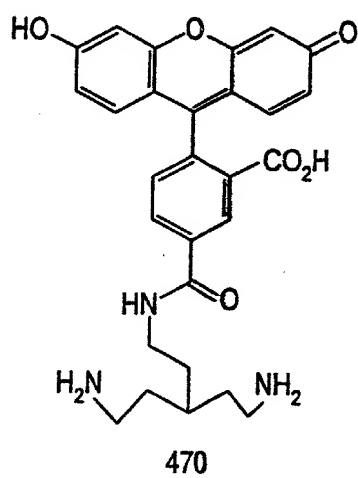
FIG. 14
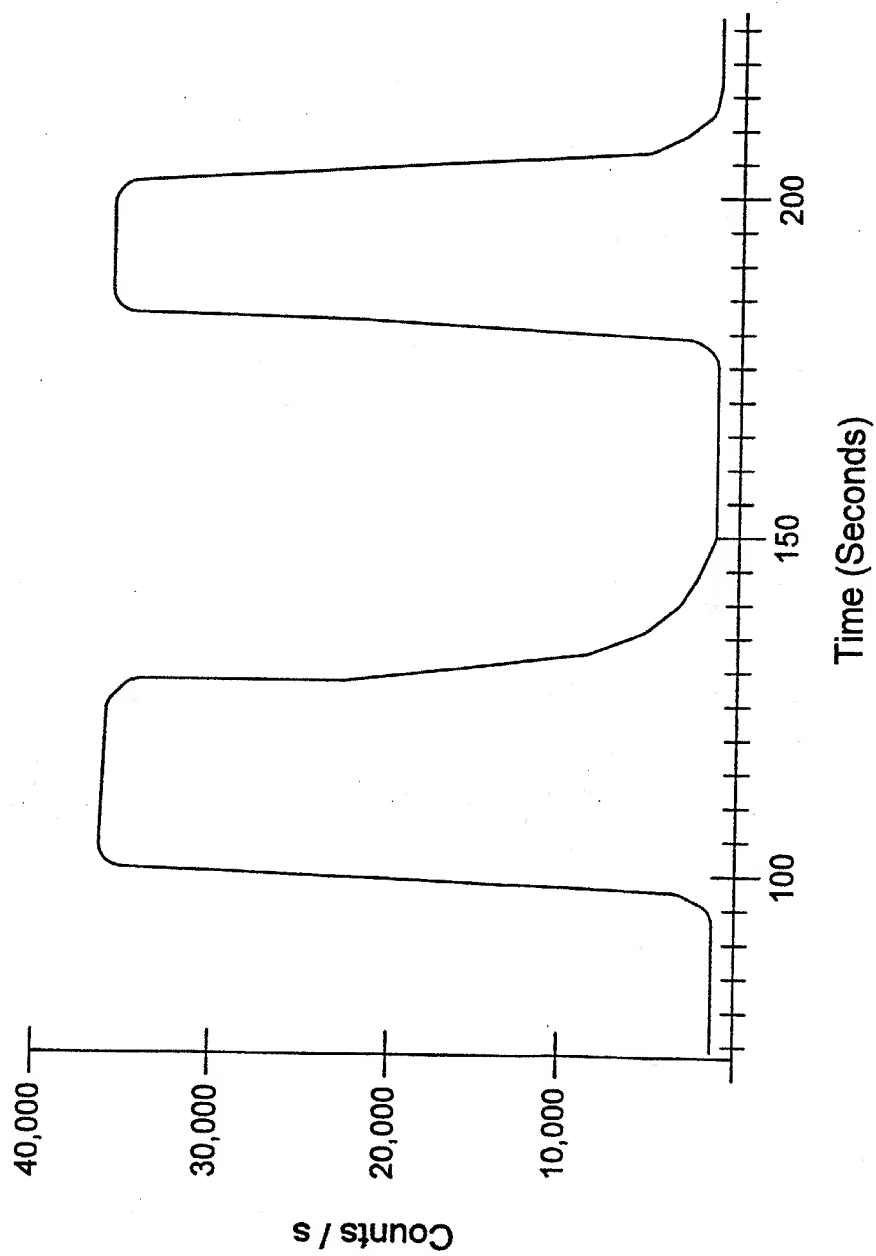
FIG. 15

RESIN: pH	Ion	Blank	Alizarin	o-Cresol-phthalein	Fluorescein	Alizarin-Ce^{3+} complex
2	none					
2	Ca^{2+}					
7	none					
7	Ca^{2+}					
7	F$^-$					
12	none					
12	Ca^{2+}					
12	F$^-$					

FIG. 16

512

550

554 556 552

522

530

540

FIG. 17

573
512
550
520
575
530
560
576
578
572
570
574
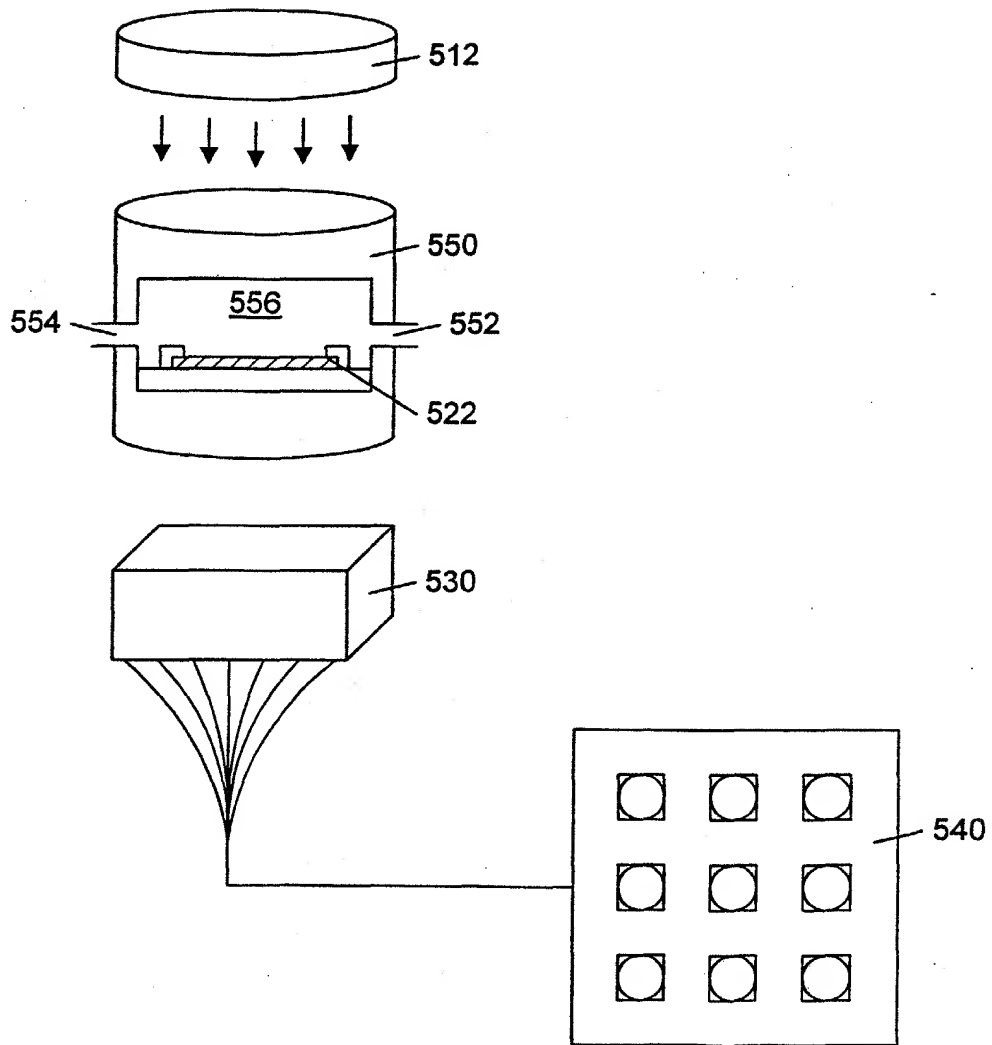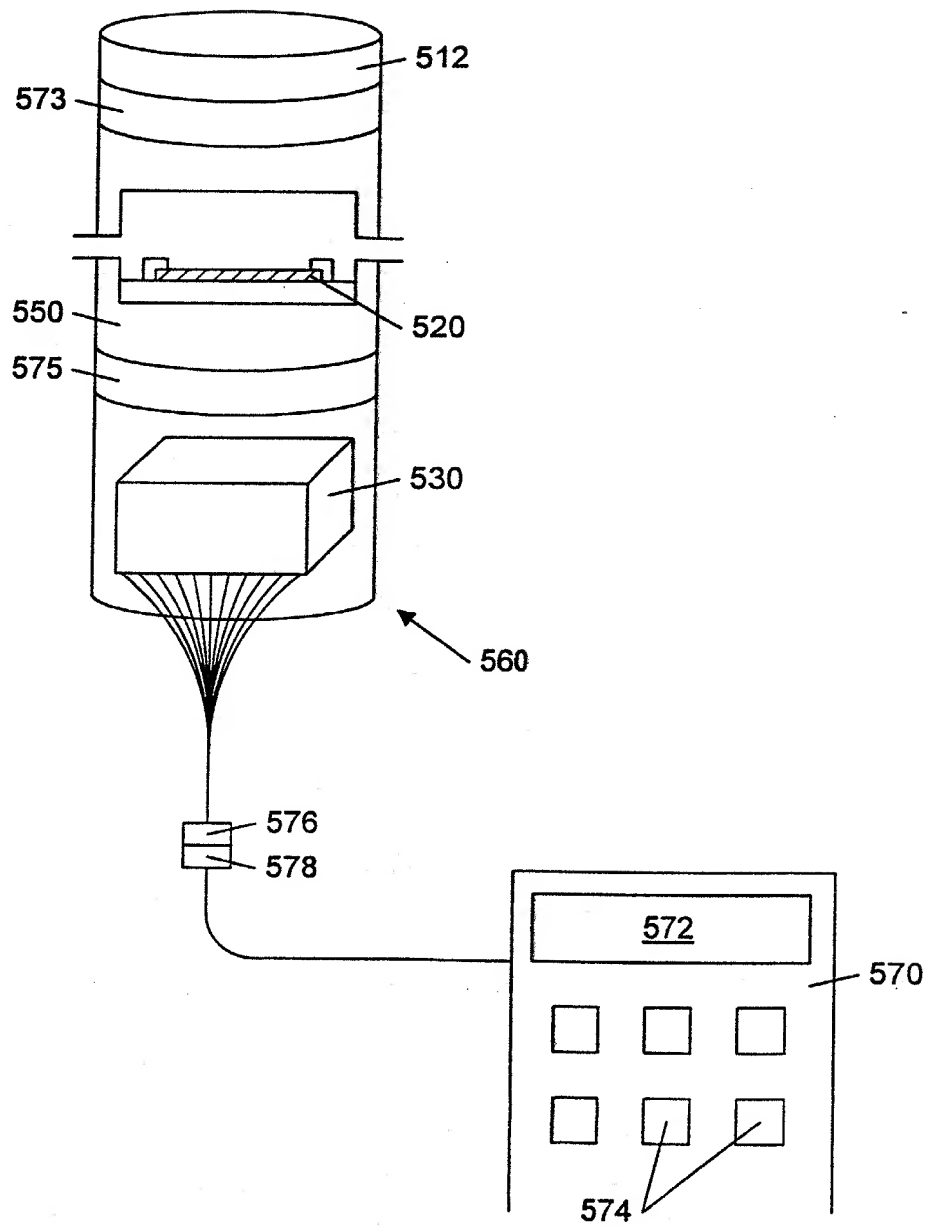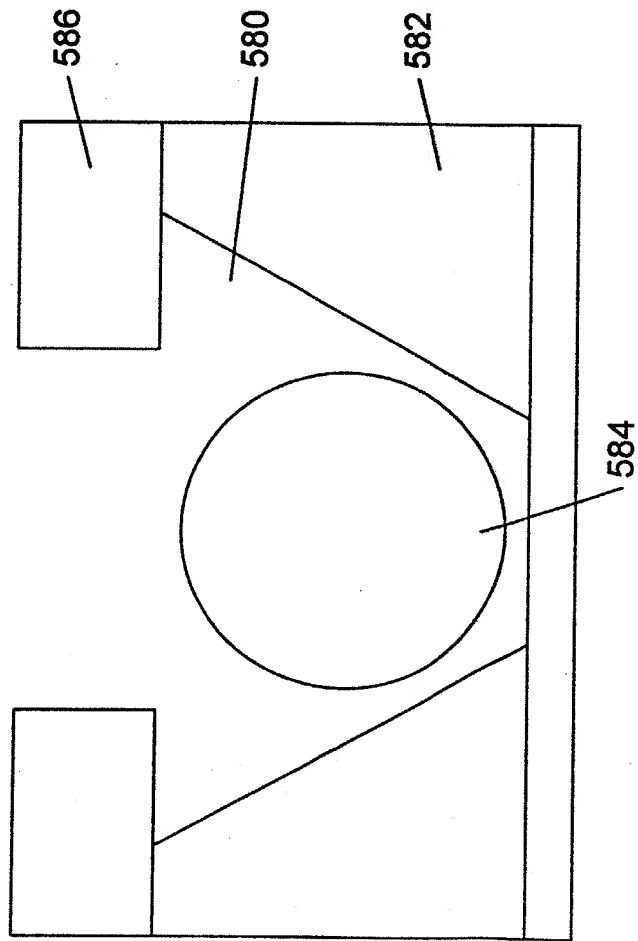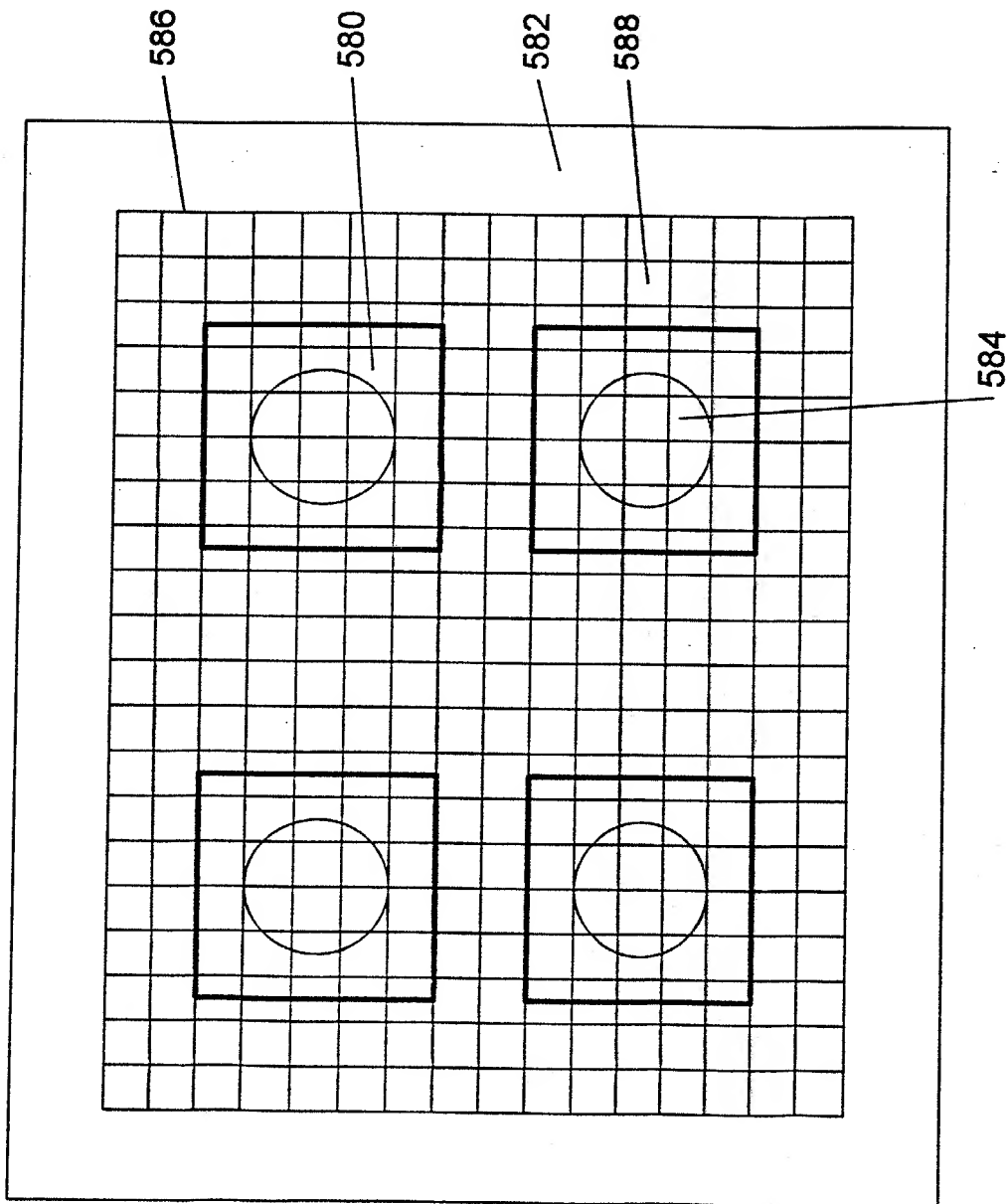
FIG. 18

FIG. 19

FIG. 20

FIG. 21A

FIG. 21B

FIG. 21C

622   614

FIG. 21D

622   614

620   614   620

614

620   620

FIG. 21E

640   641   640
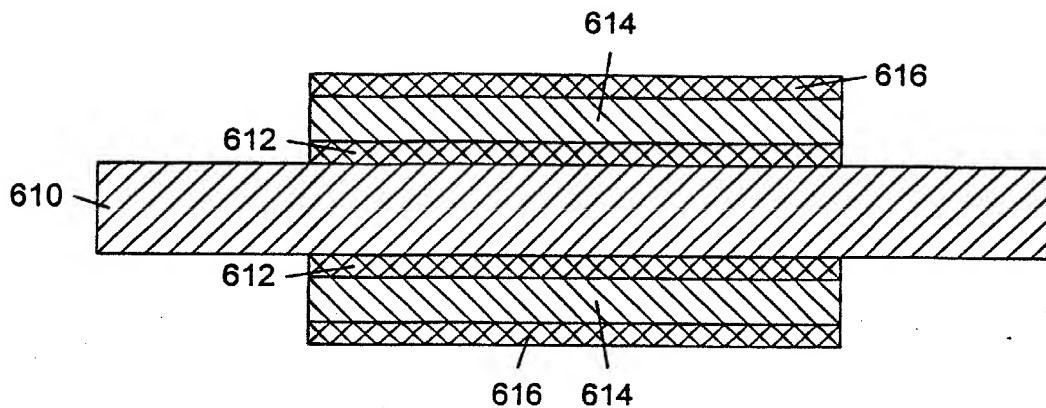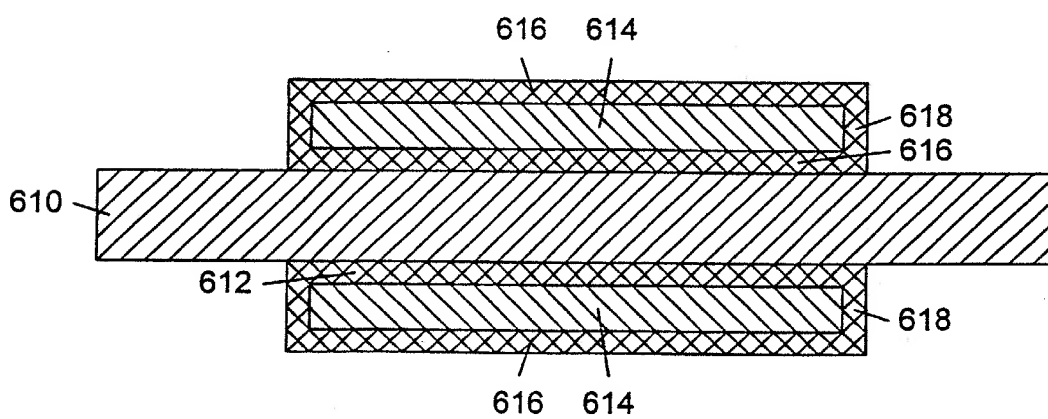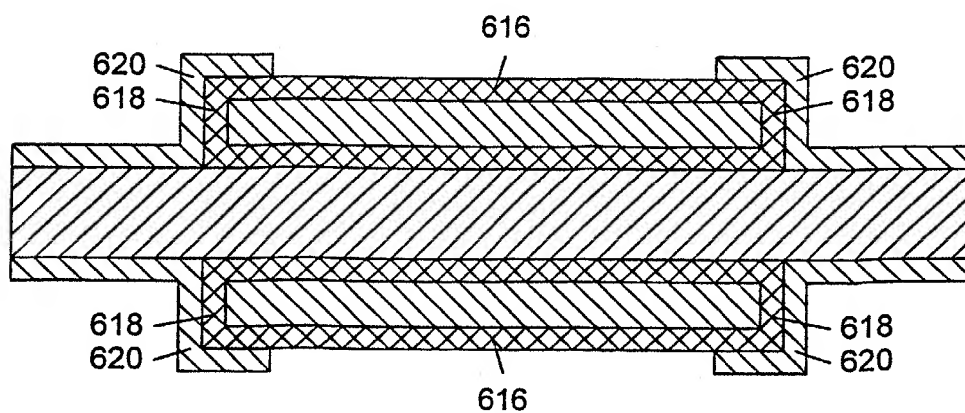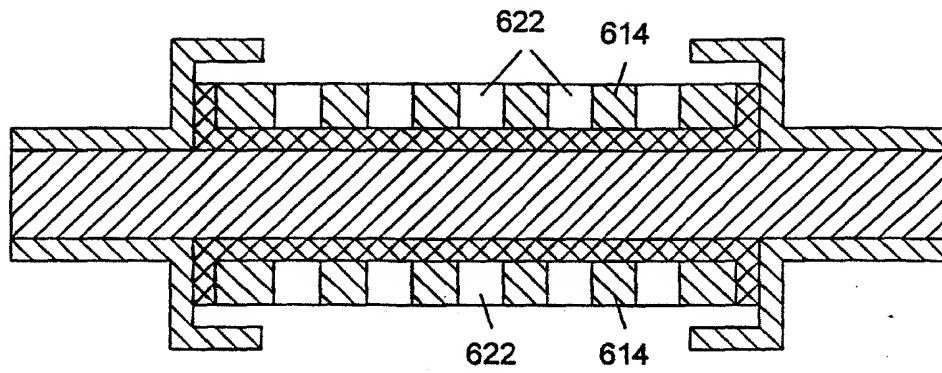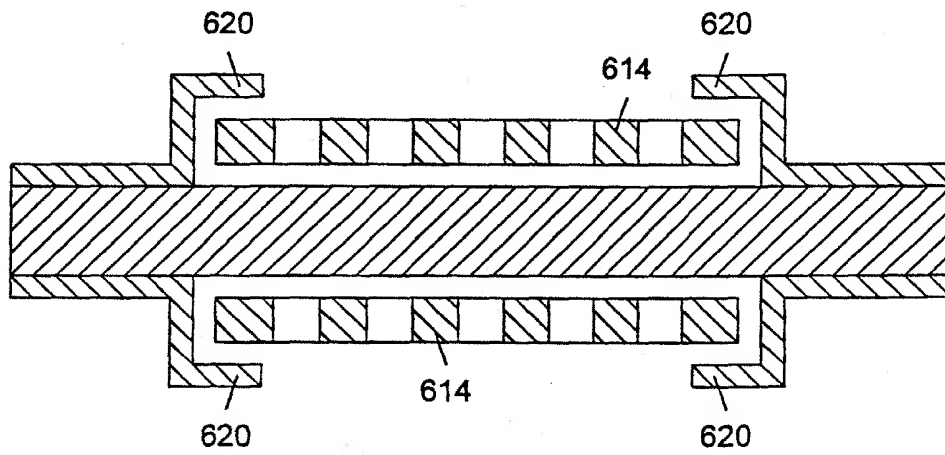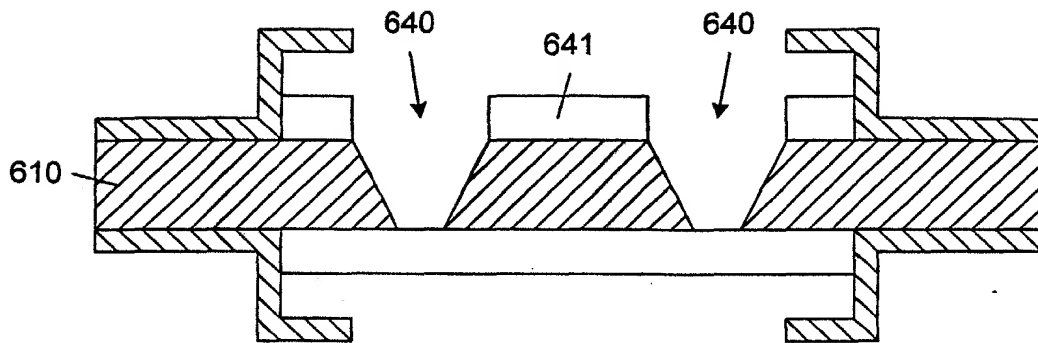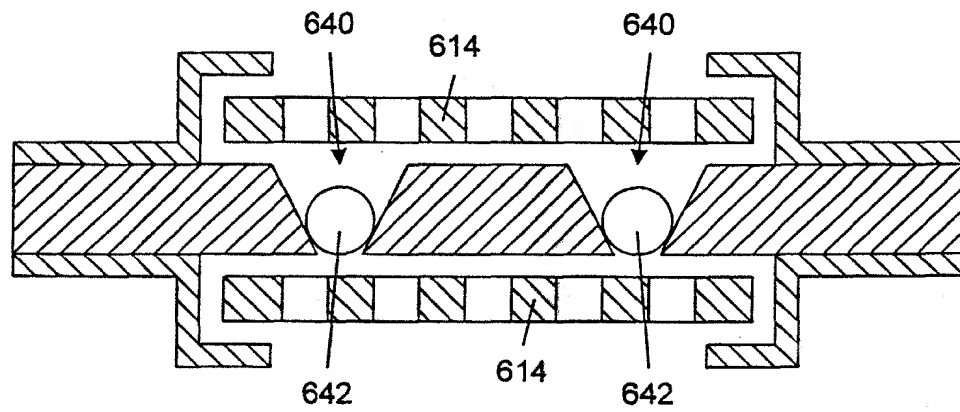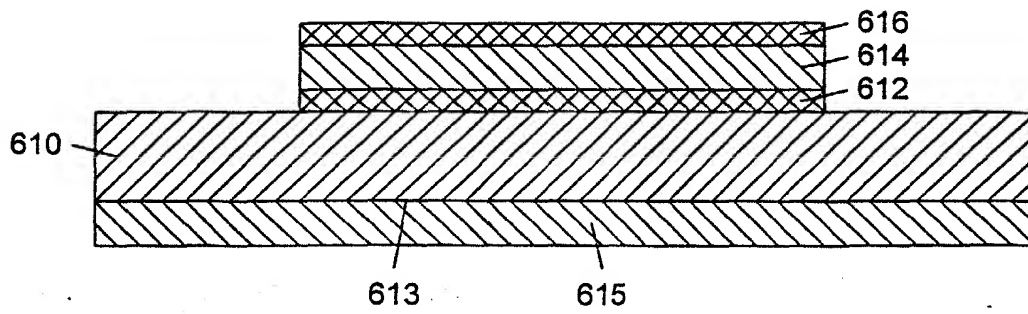
610

FIG. 21F

640   614   640

642   614   642

FIG. 21G
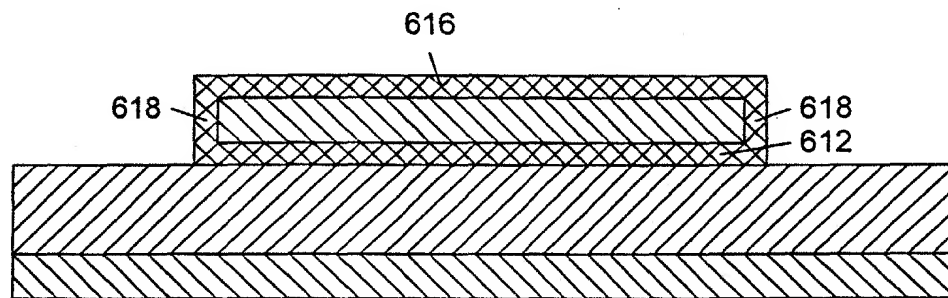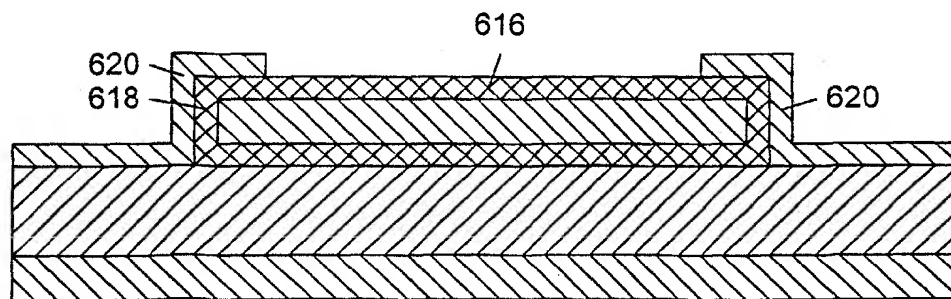
FIG. 22A

FIG. 22B

FIG. 22C

FIG. 22D

FIG. 22E

640   640
641   641

FIG. 22F

622   614
611
610
642 640   623 642
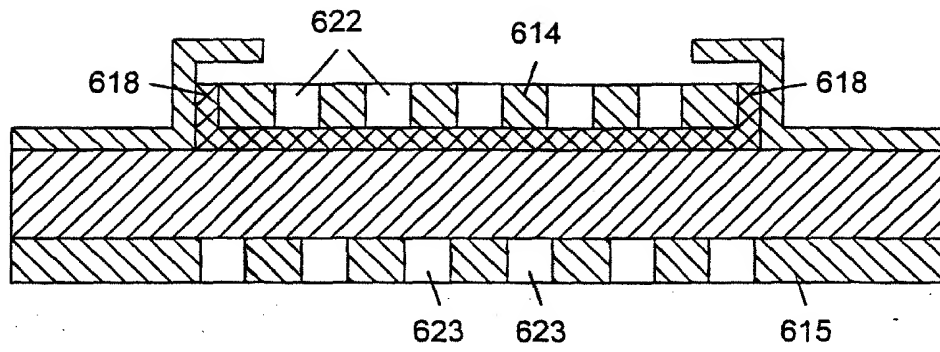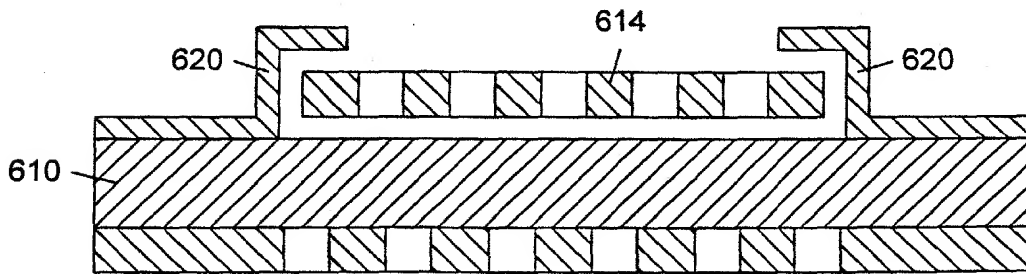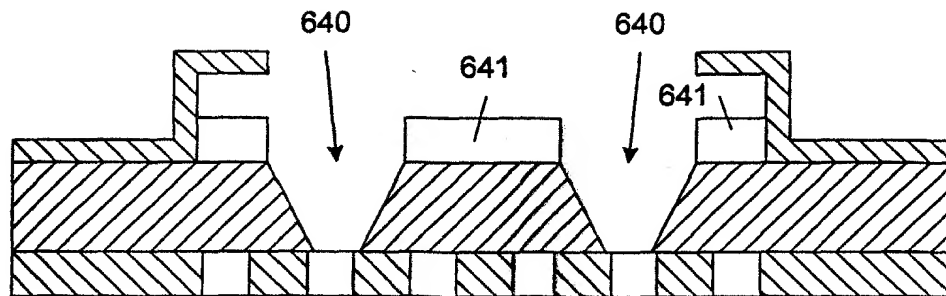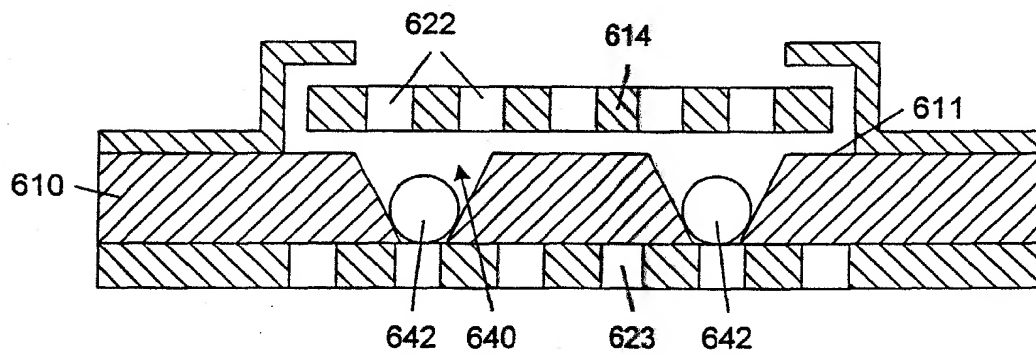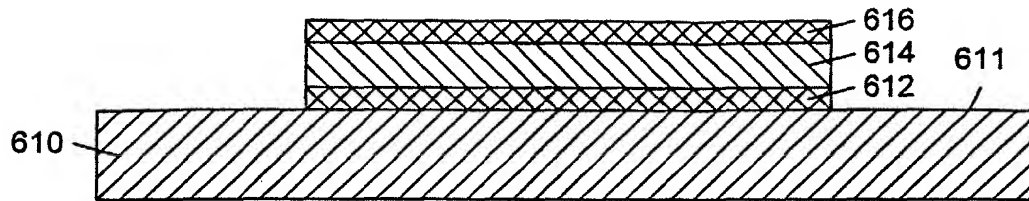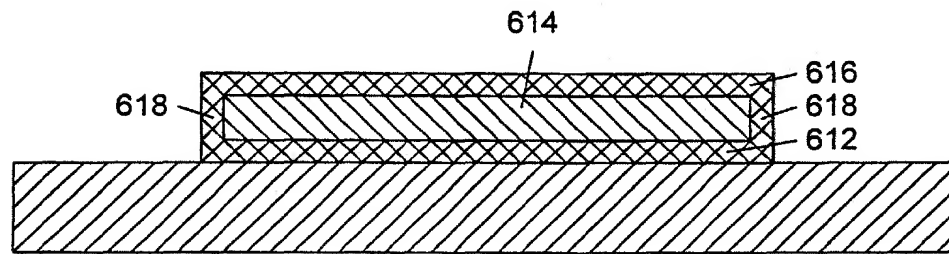
FIG. 22G

FIG. 23A

FIG. 23B
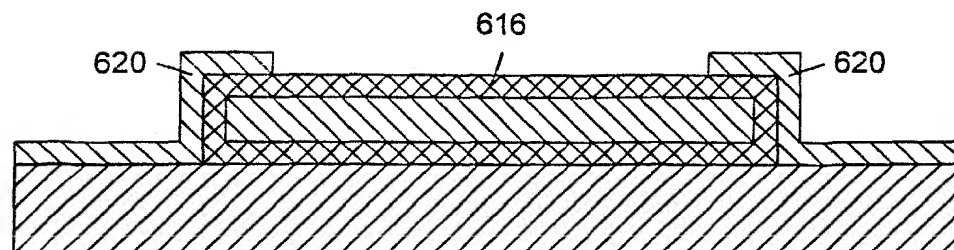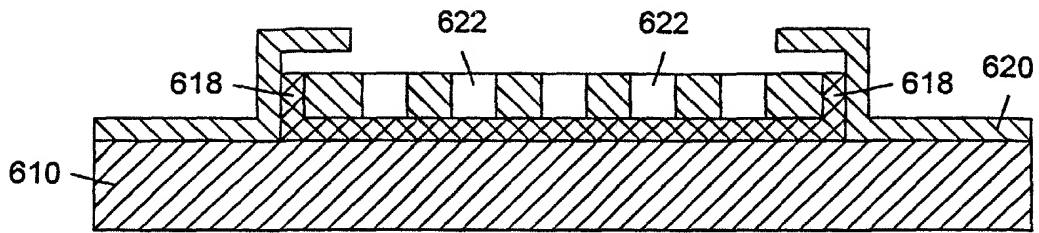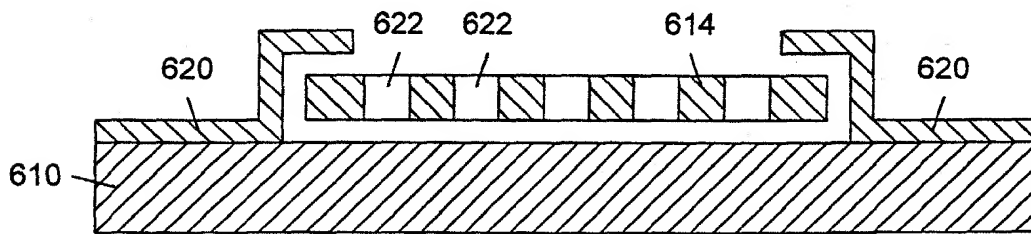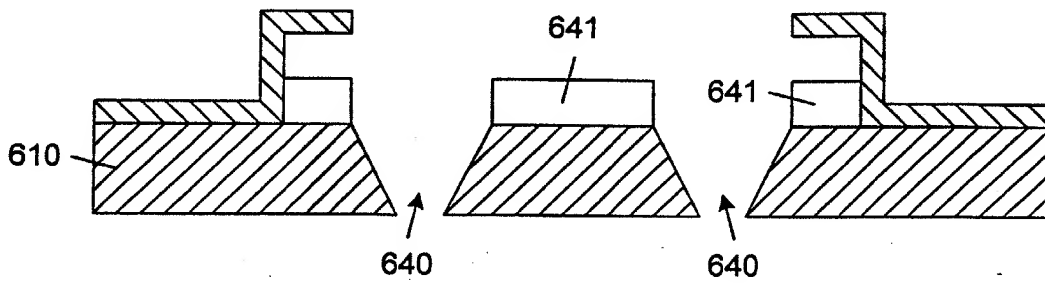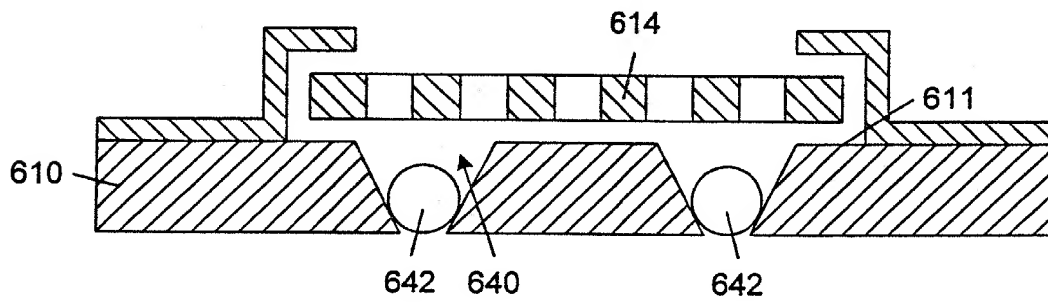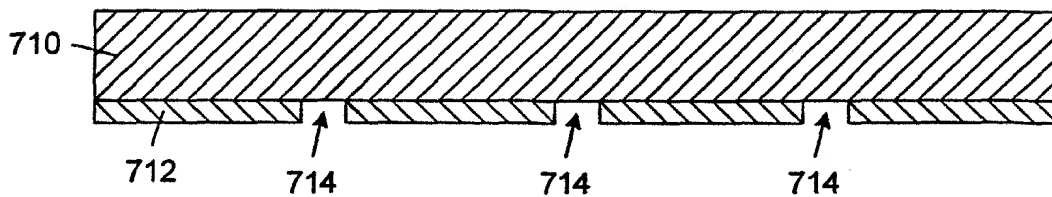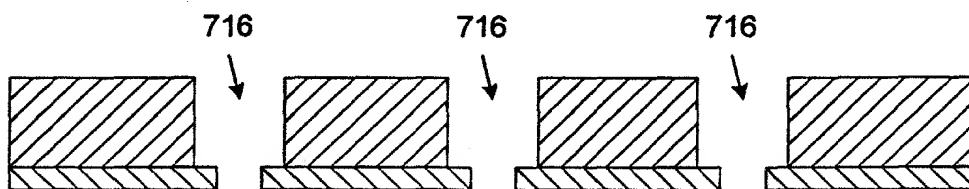

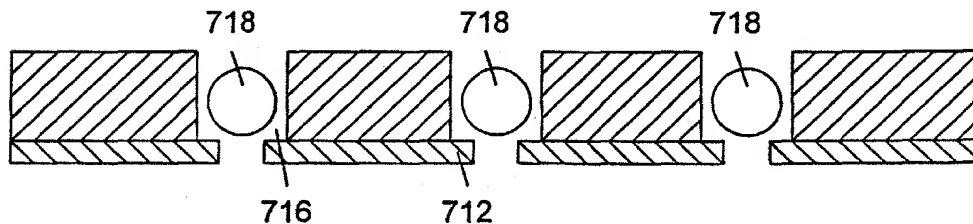FIG. 23C

FIG. 23D
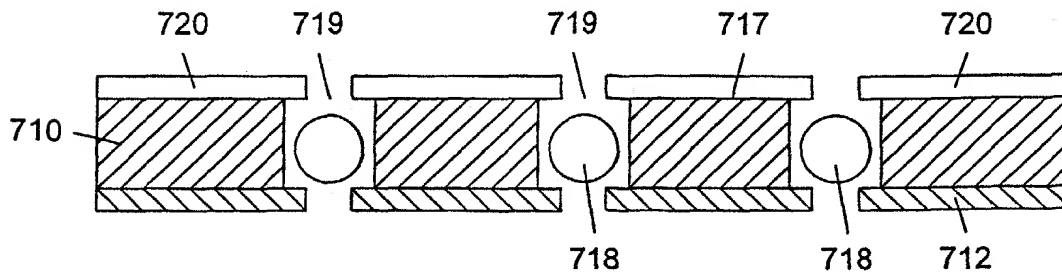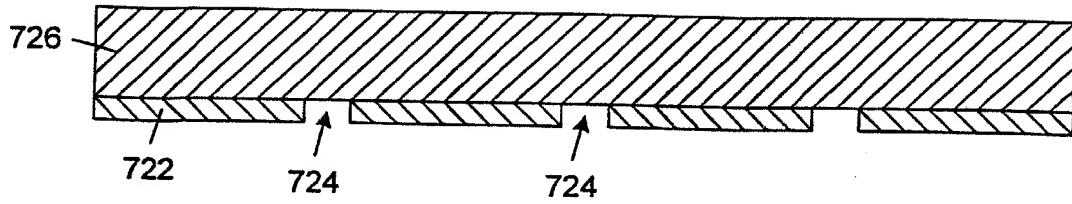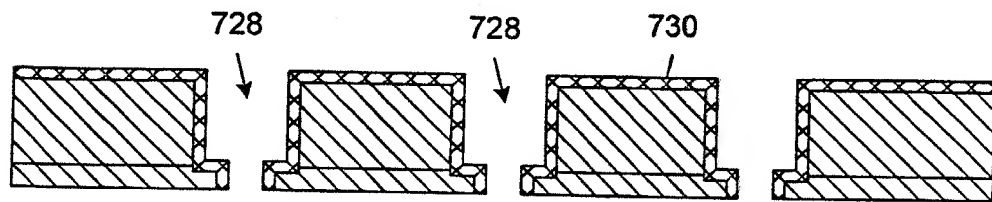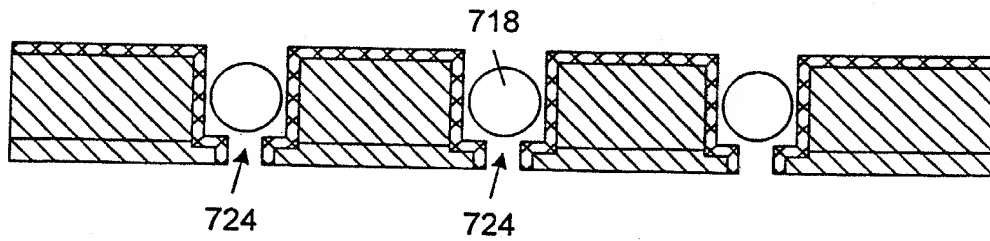

FIG. 23E

FIG. 23F

FIG. 23G

FIG. 24A

FIG. 24B

FIG. 24C

FIG. 24D

FIG. 25A

FIG. 25B

FIG. 25C

FIG. 25D

742   742   742

744   744   740

743

FIG. 26A

718   718   718

740

743

FIG. 26B

744 745   739   739

740

FIG. 26C

742   742

FIG. 26D

746   748

742
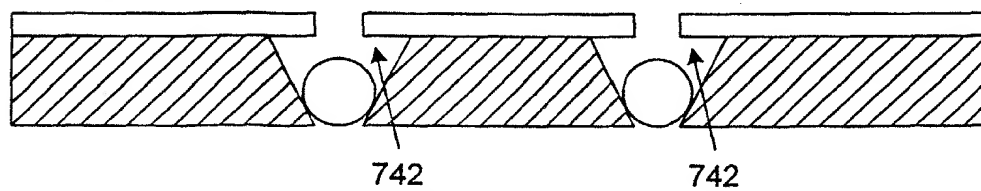
FIG. 26E

FIG. 27A

FIG. 27B

FIG. 27C

FIG. 27D

762   762

760

FIG. 28A

764
762

FIG. 28B

768
766
764
762

FIG. 28C
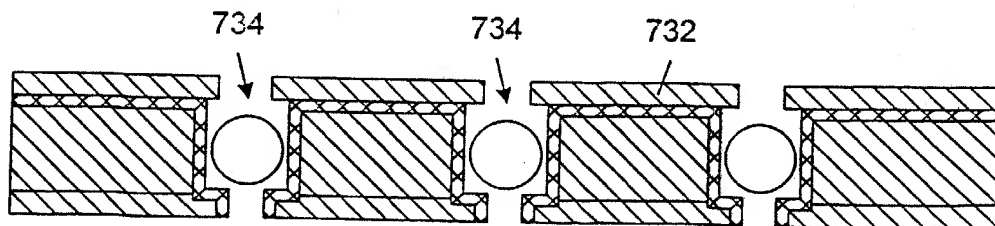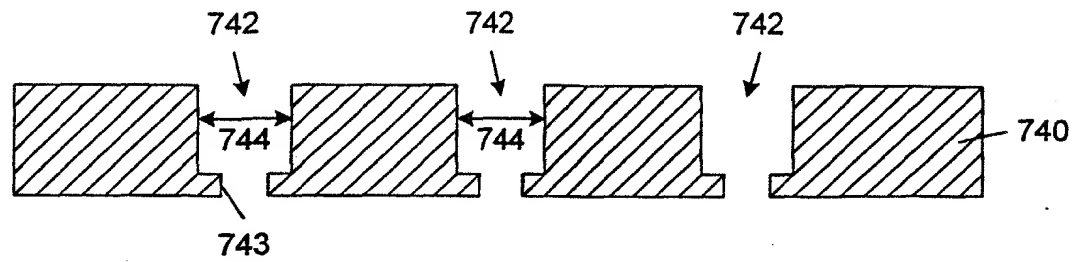
762   762   770

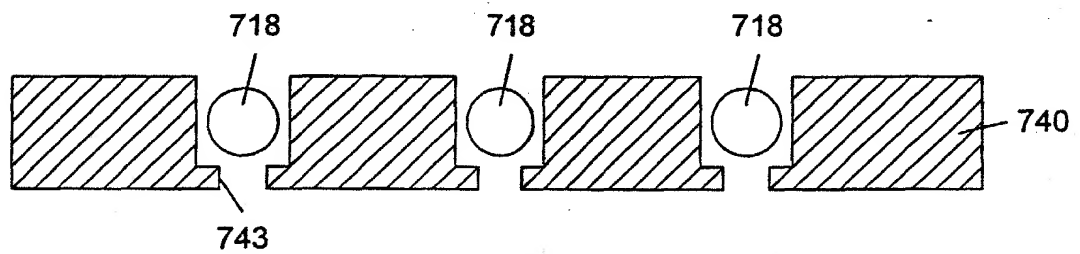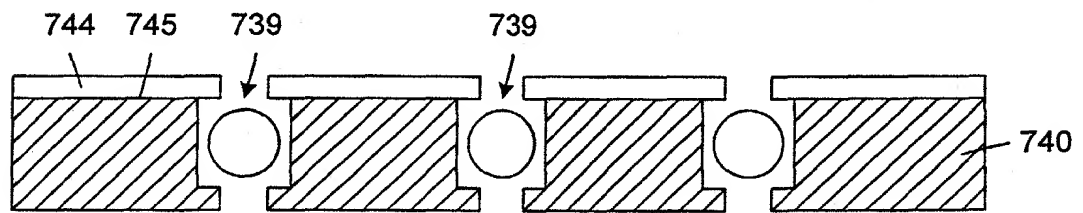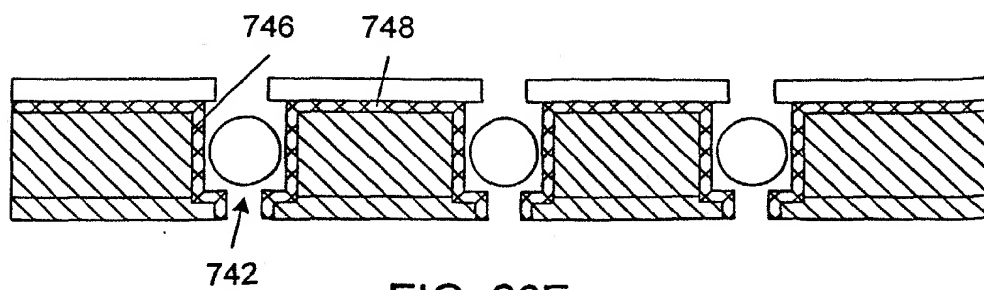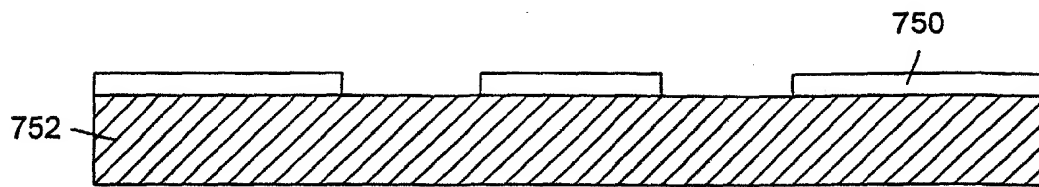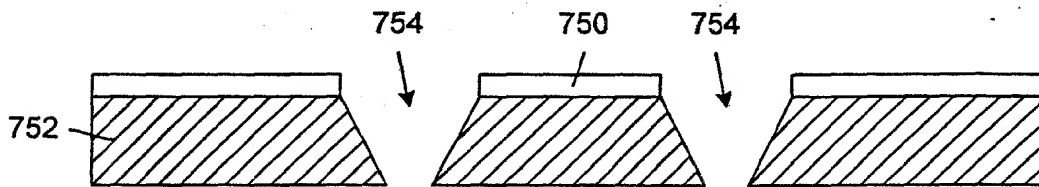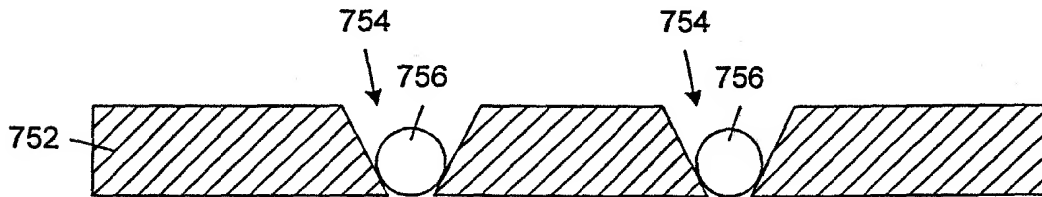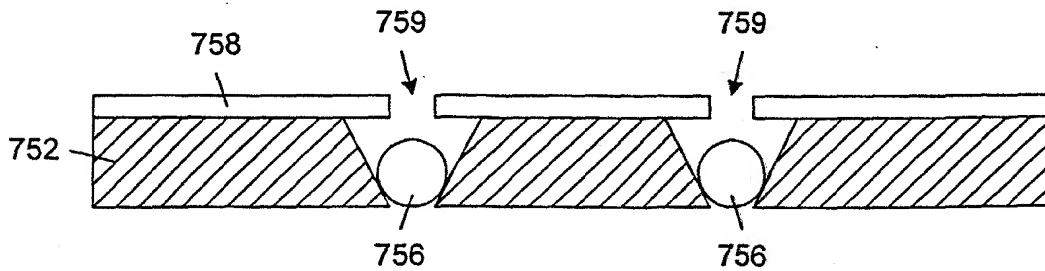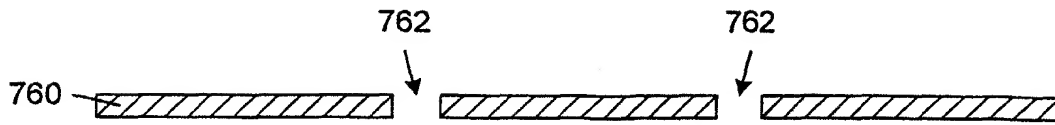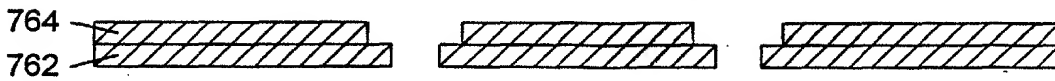772   772

FIG. 28D

778   774   778   774

776

772   772
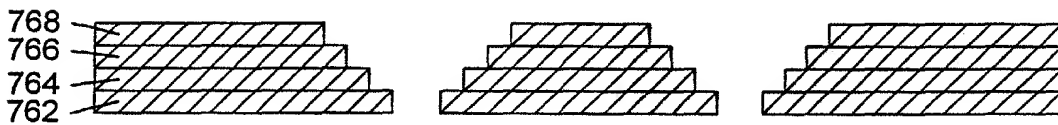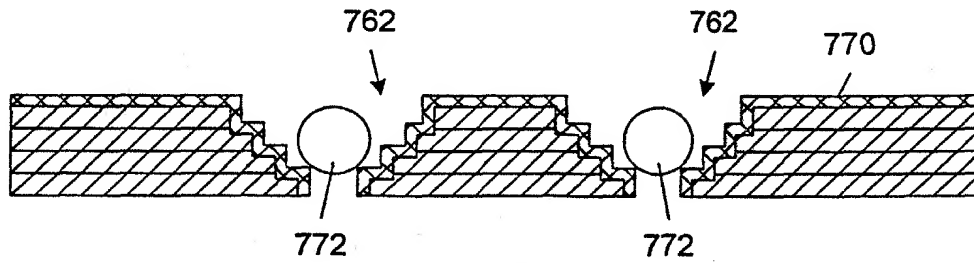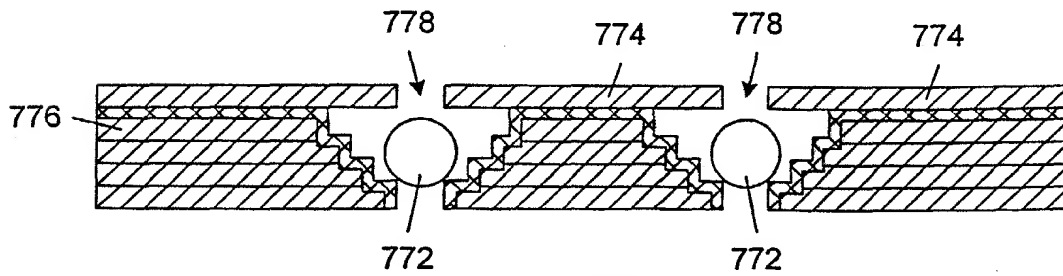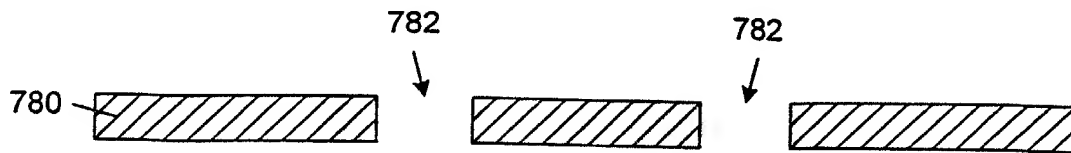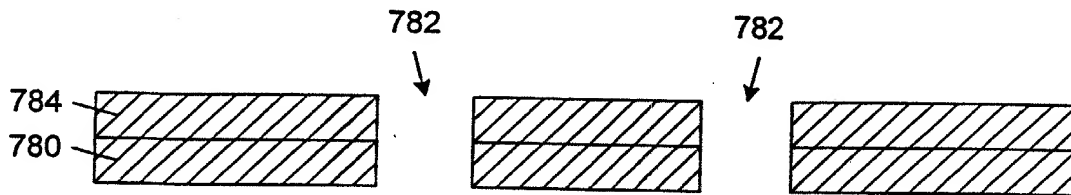
FIG. 28E

FIG. 29A

FIG. 29B

FIG. 29C

FIG. 29D

FIG. 29E

792   792   792

790

FIG. 30A

795   795   795

790

FIG. 30B

794   795   795   795

790
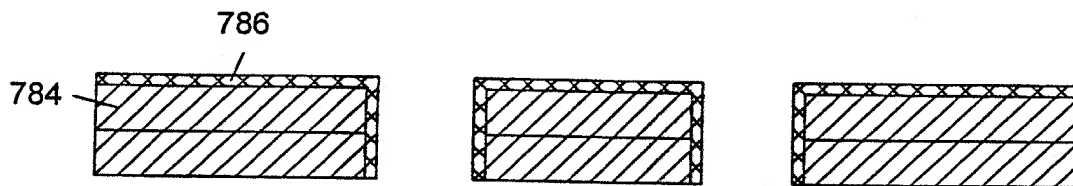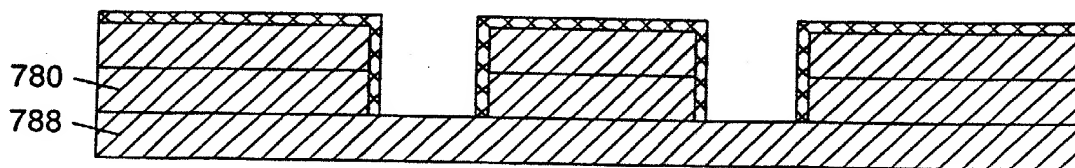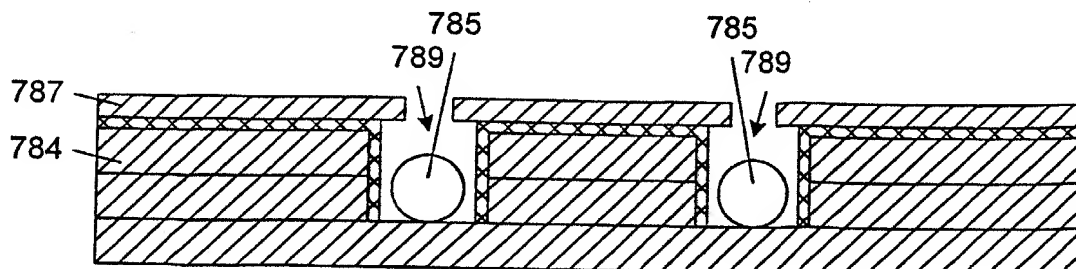
FIG. 30C

FIG. 30D

FIG. 31
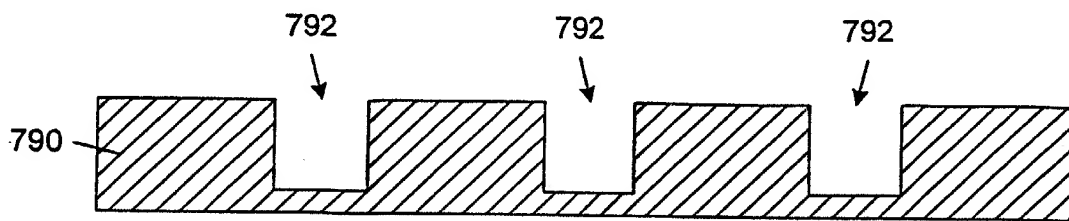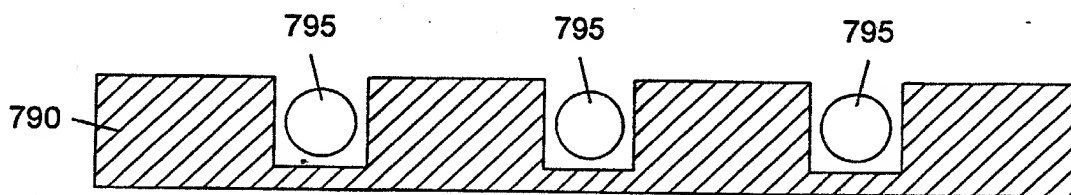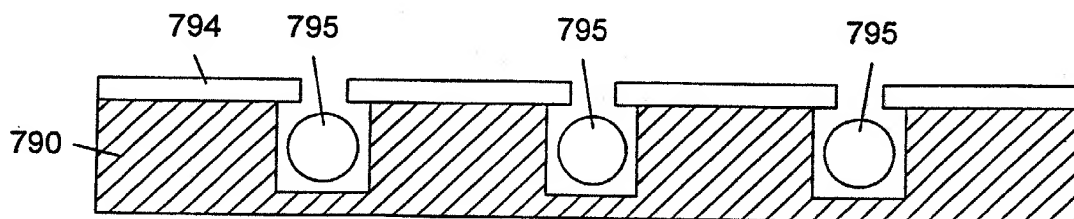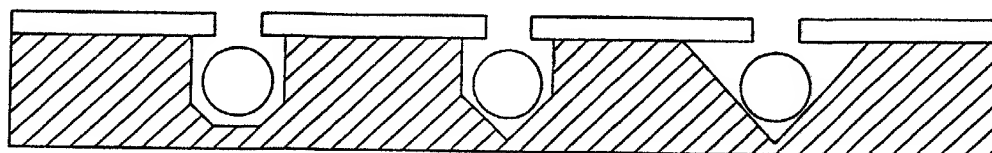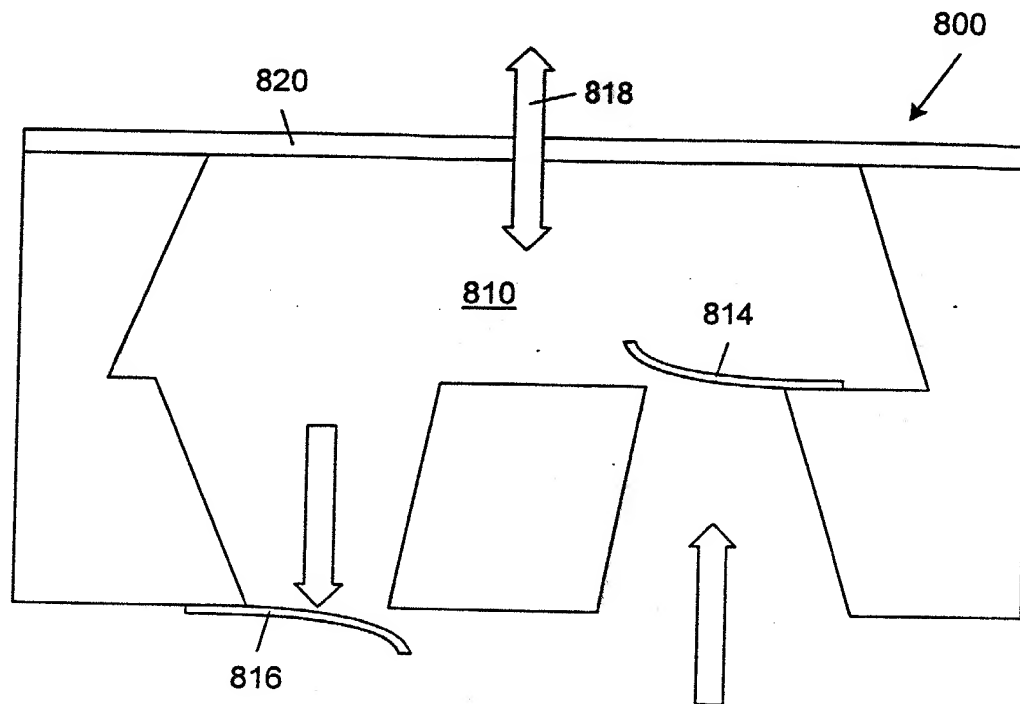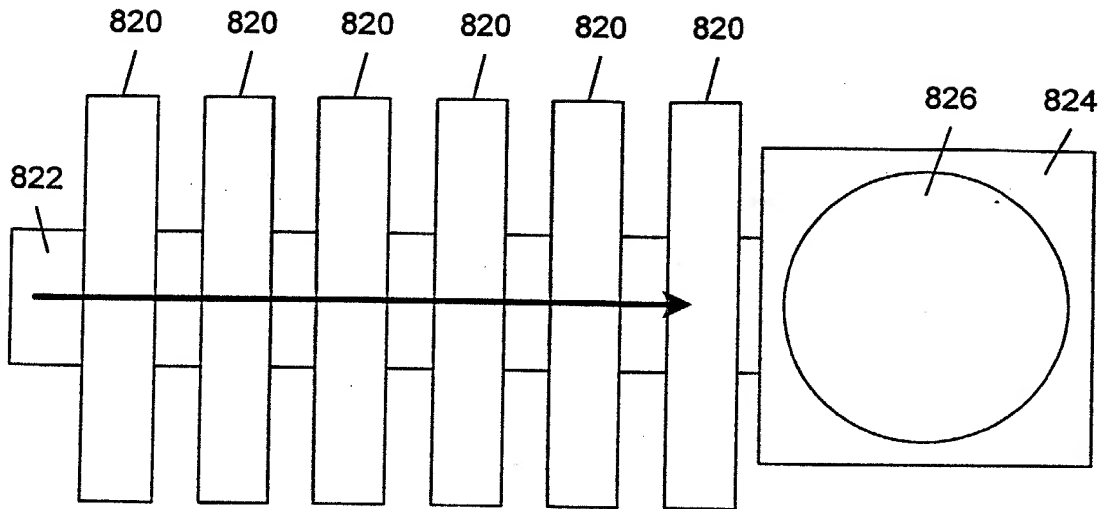
FIG. 32

FIG. 33

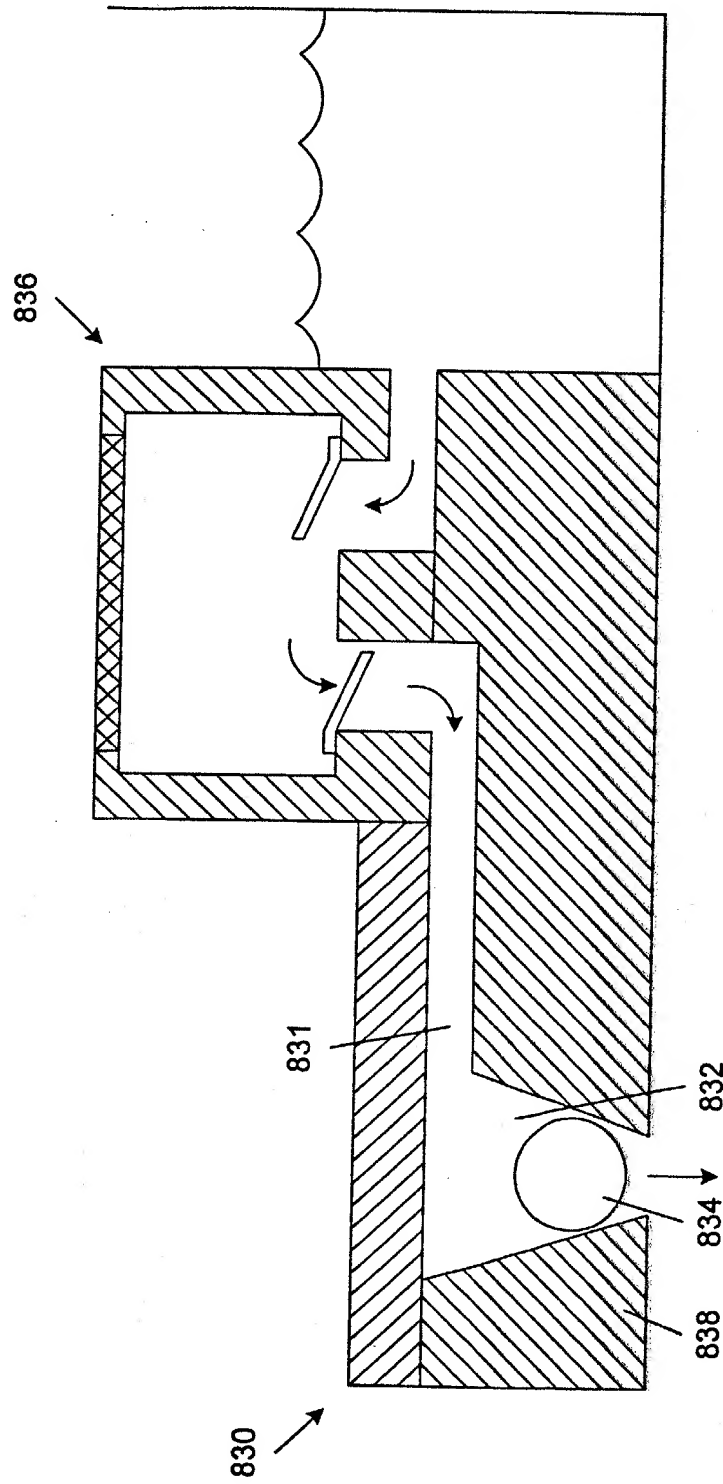FIG. 34

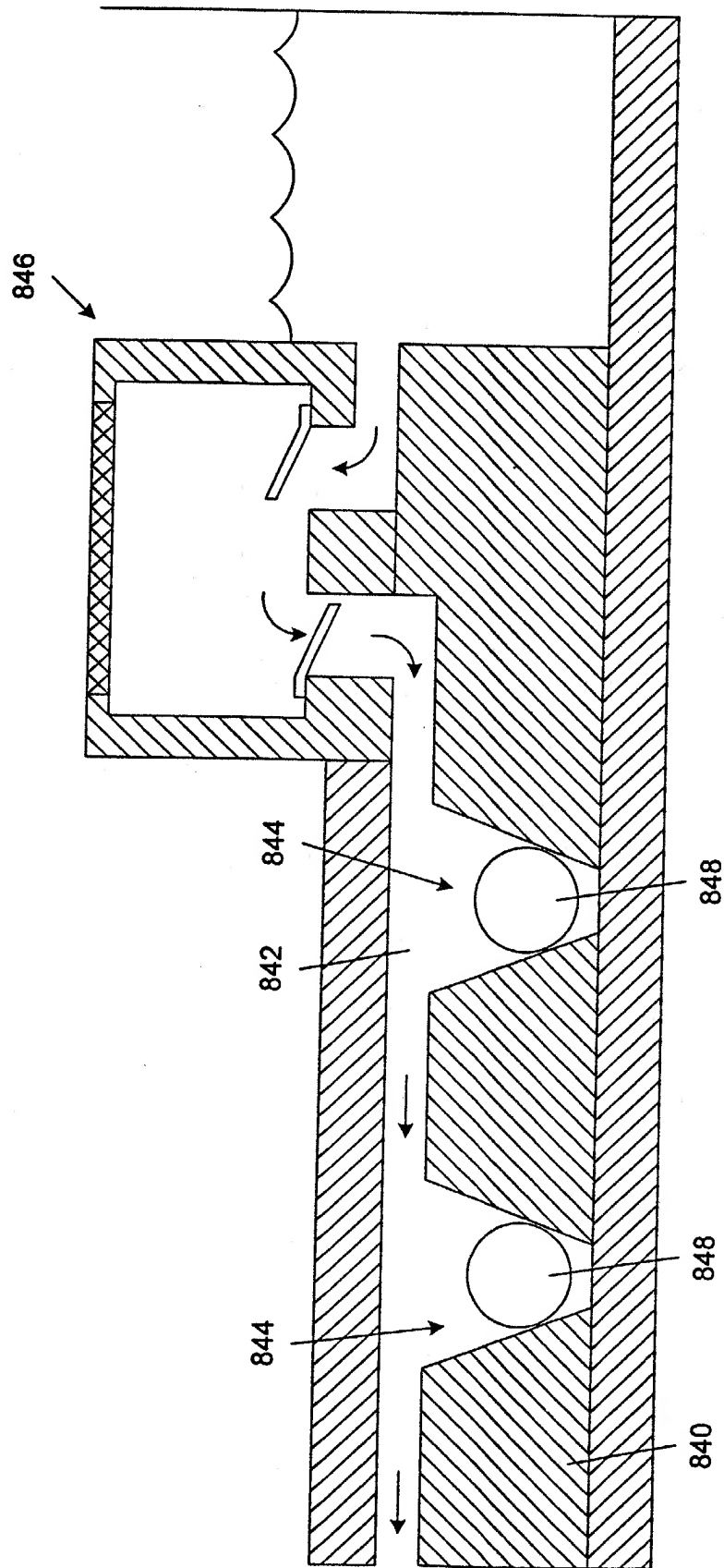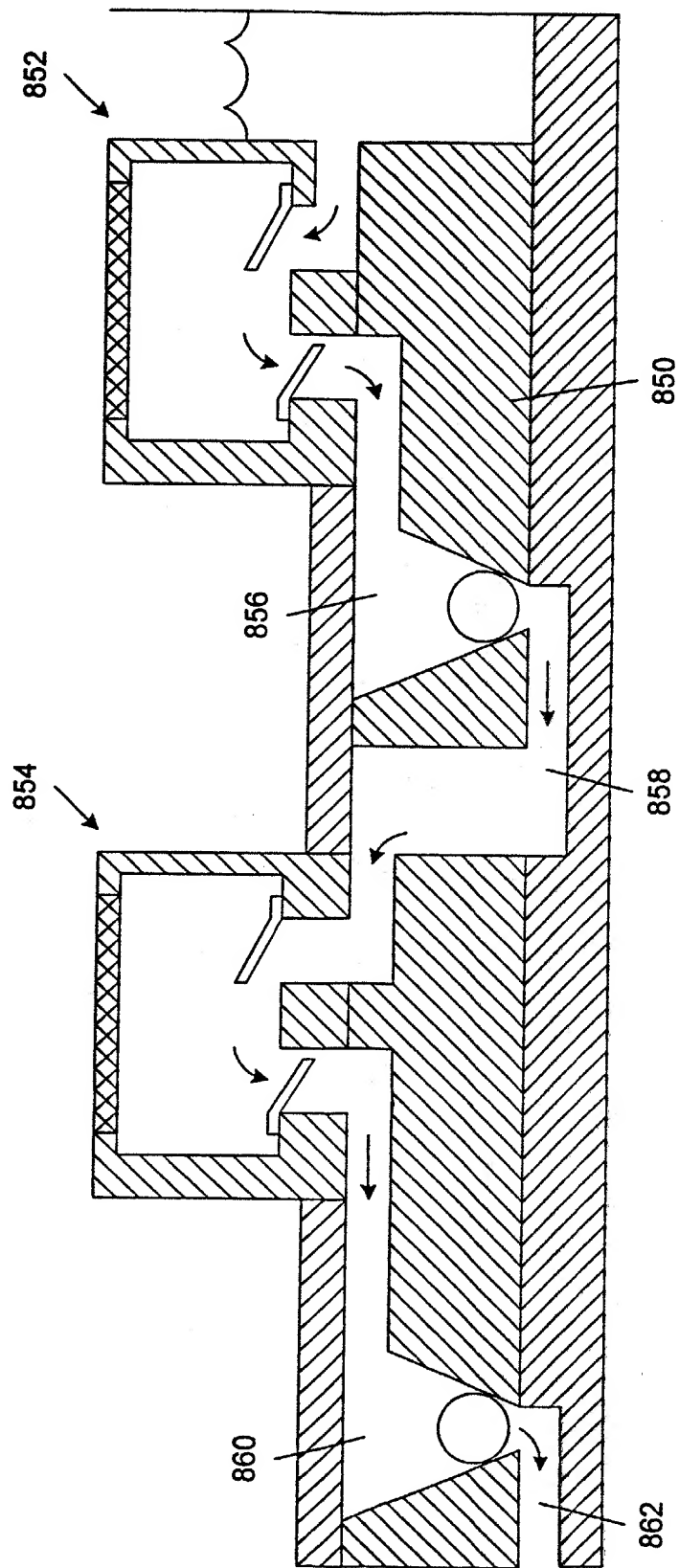FIG. 35
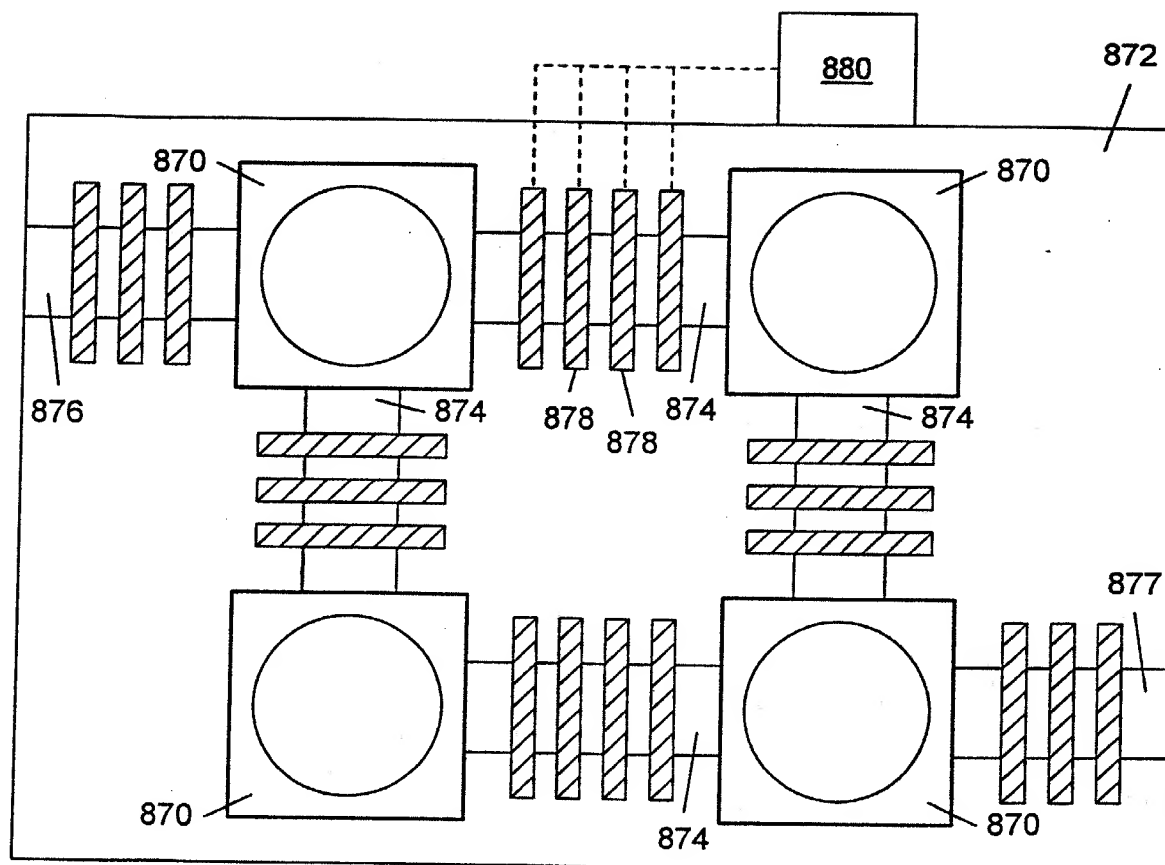
FIG. 36
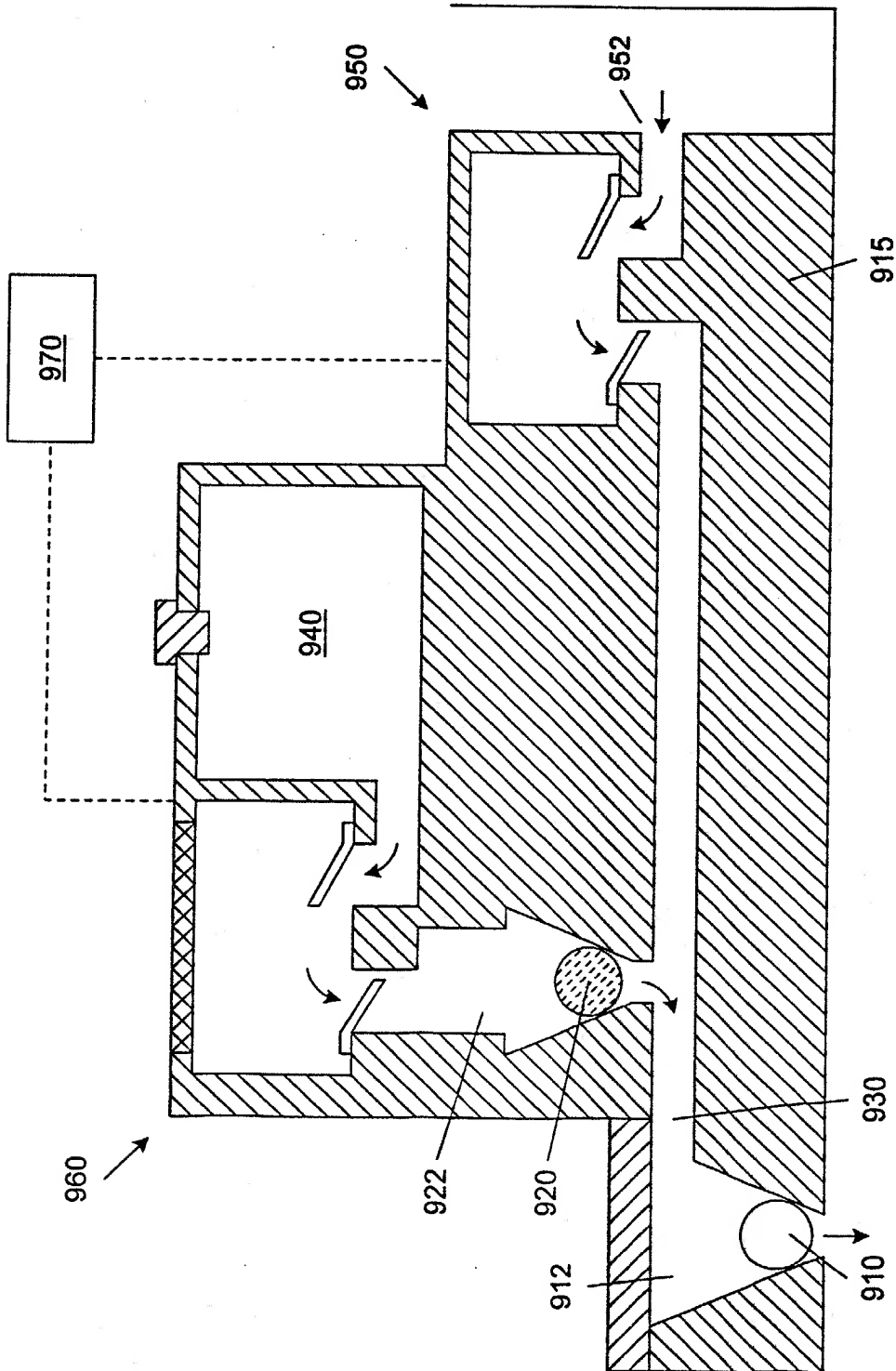
FIG. 37
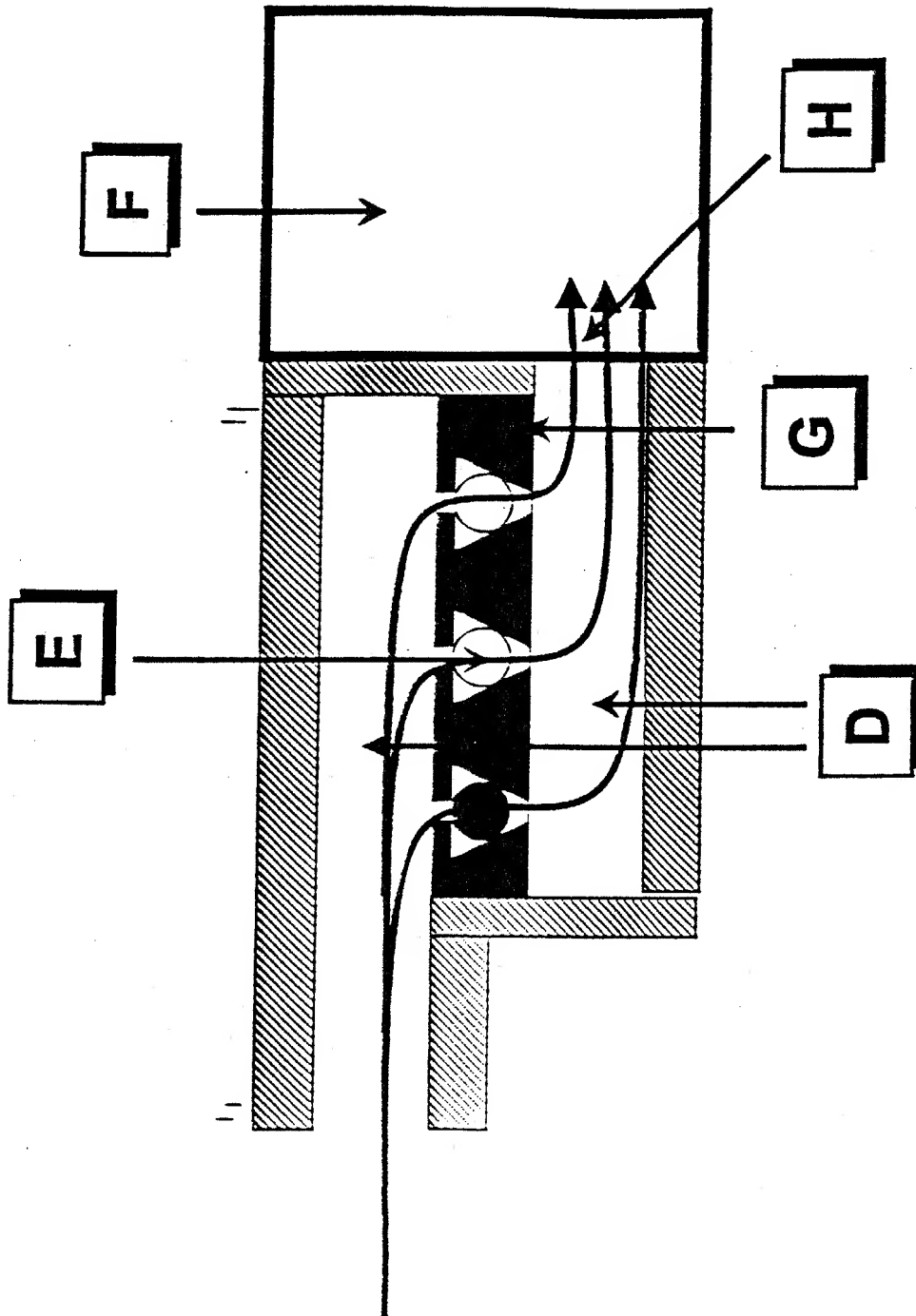
Figure 38
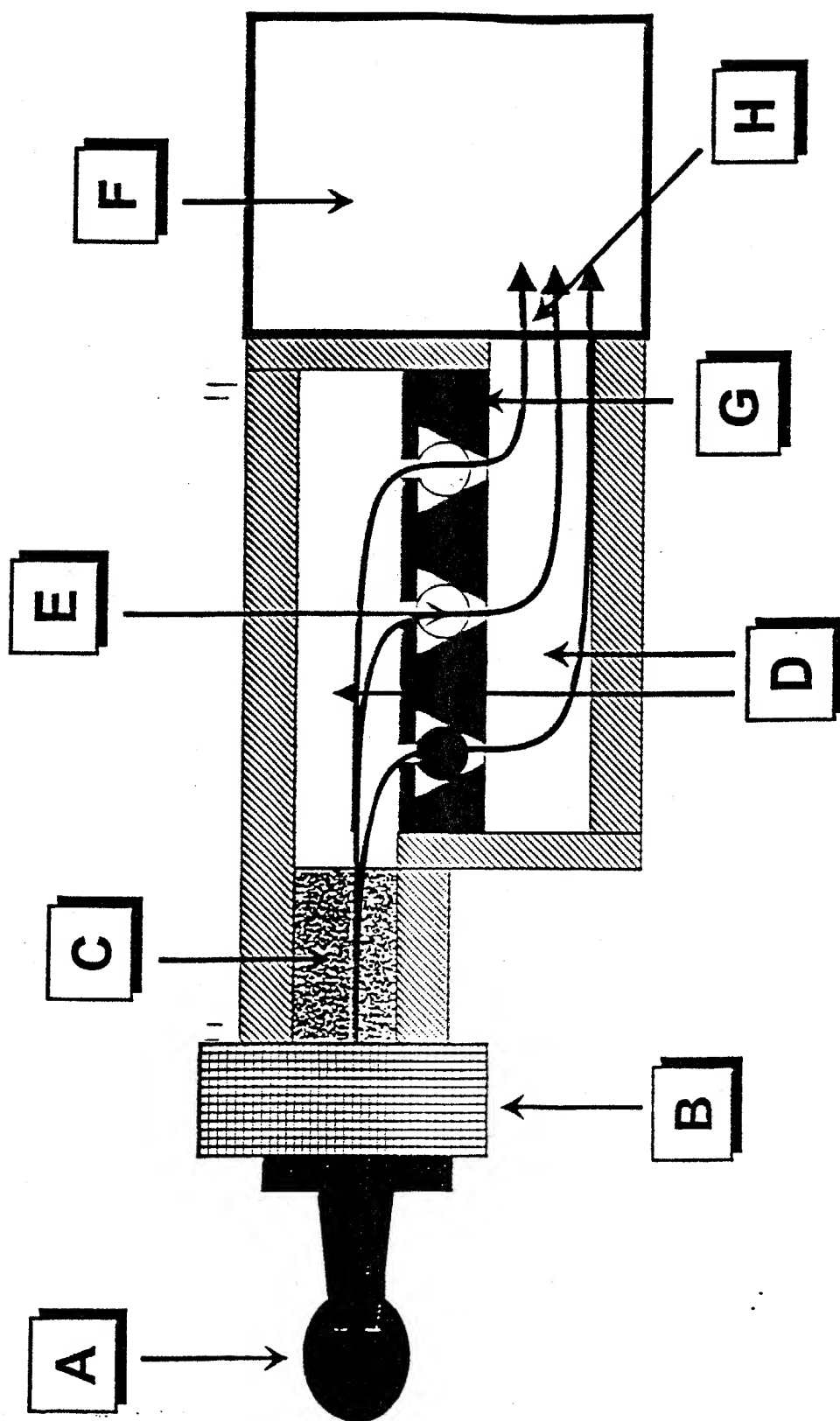
Figure 39
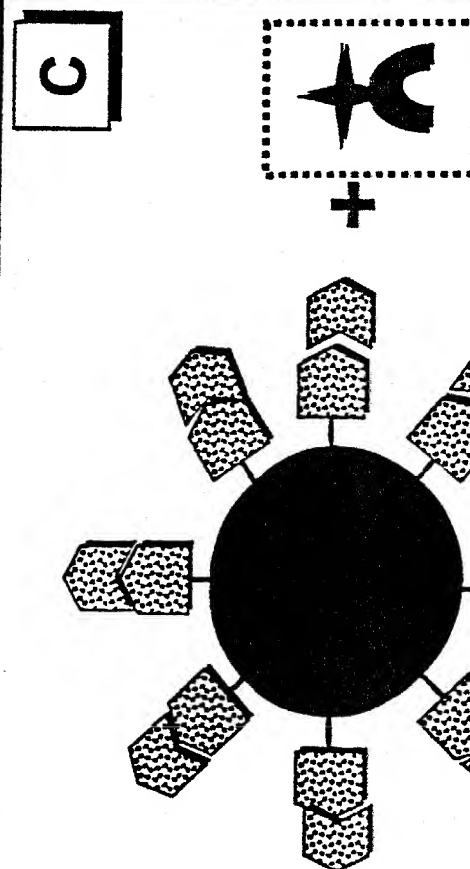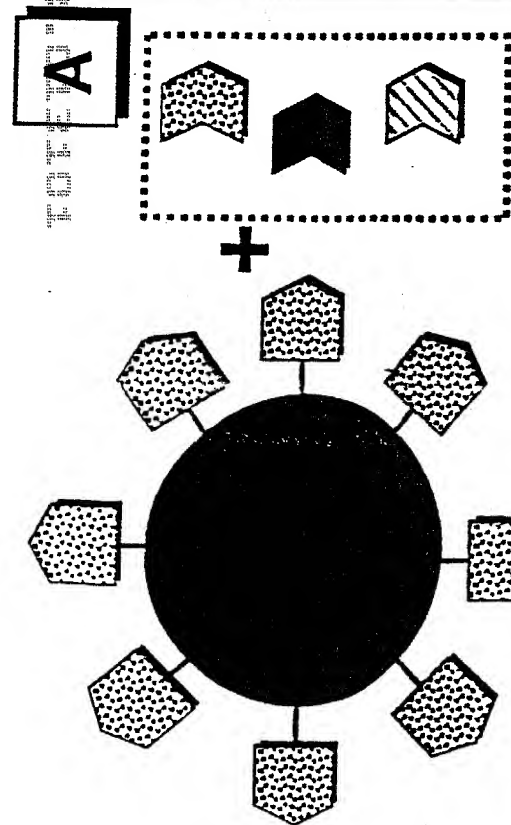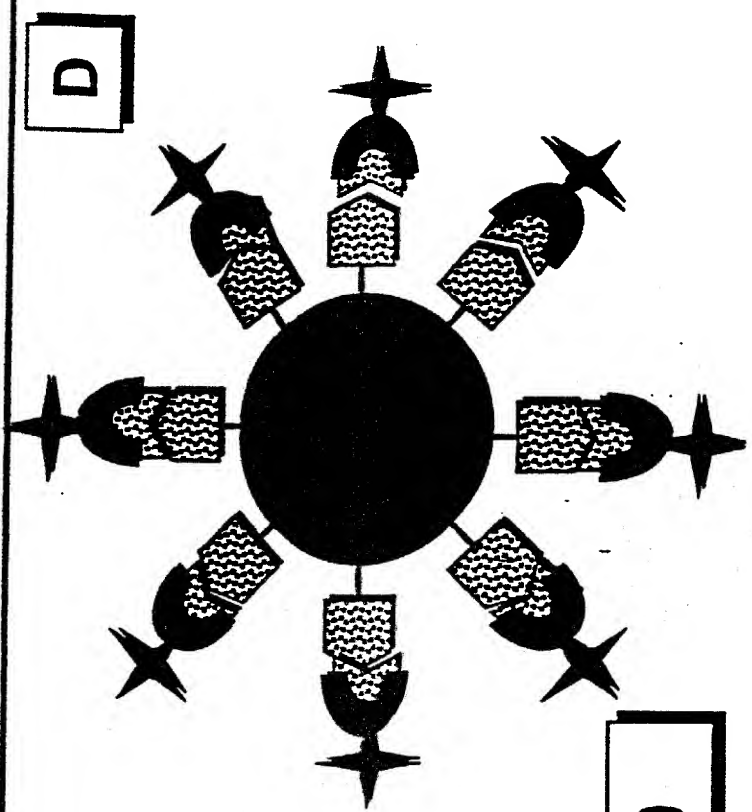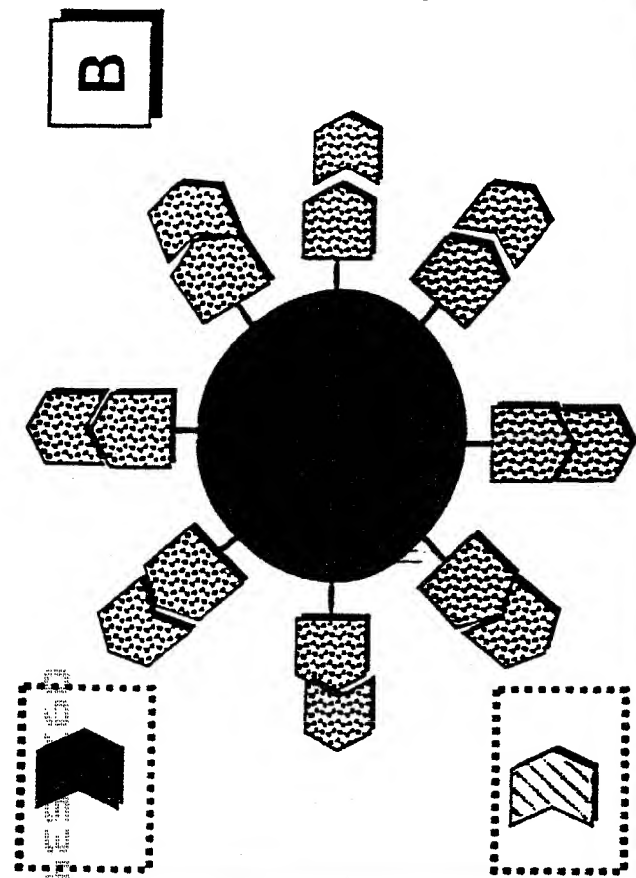
FIG. 40
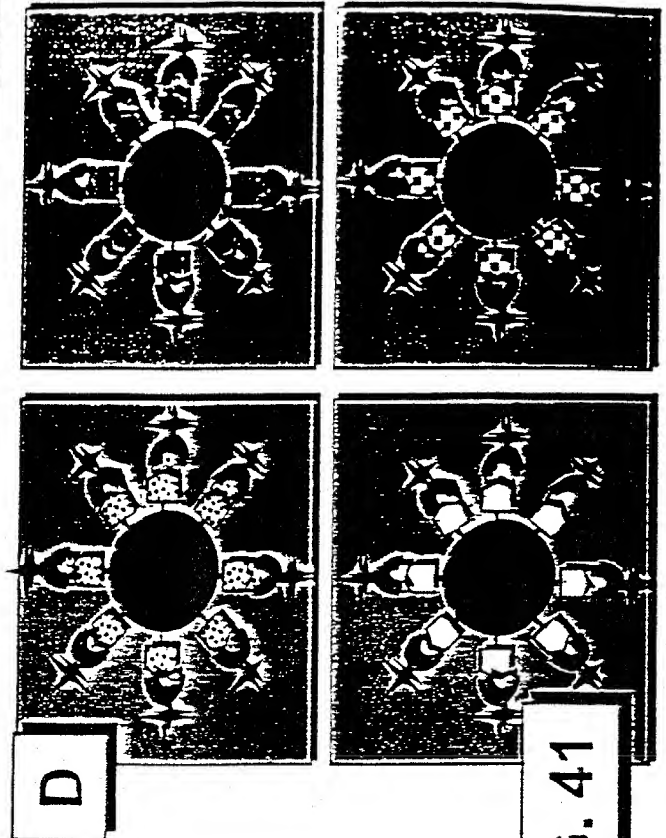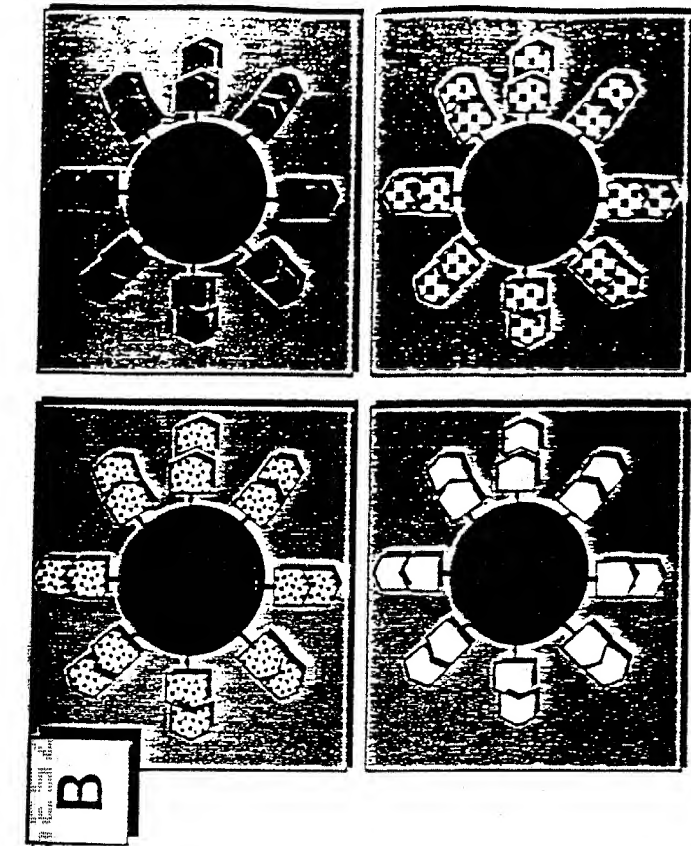
FIG. 41
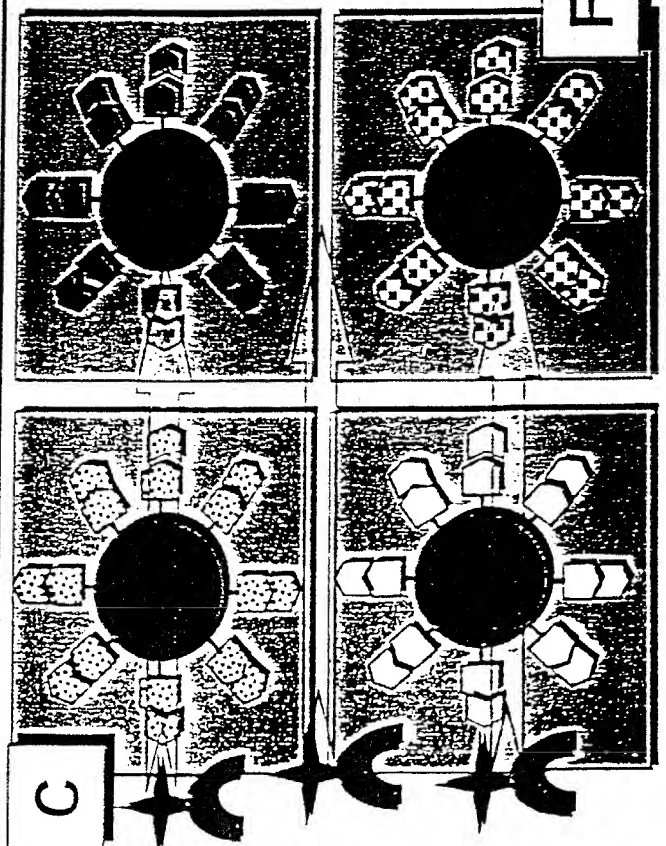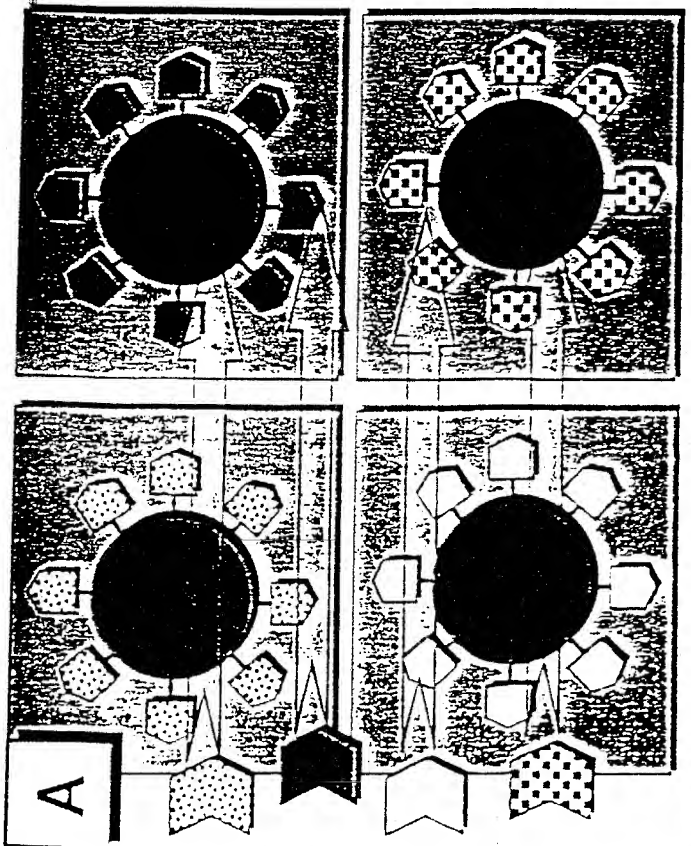
Electronic Tongue Biological Sample Acquisition
Prototype 6/2/99

Sealed Chip array
Micro-puncture device
Filter with adsorbed reagents
Standard Vacuum Source Attachment
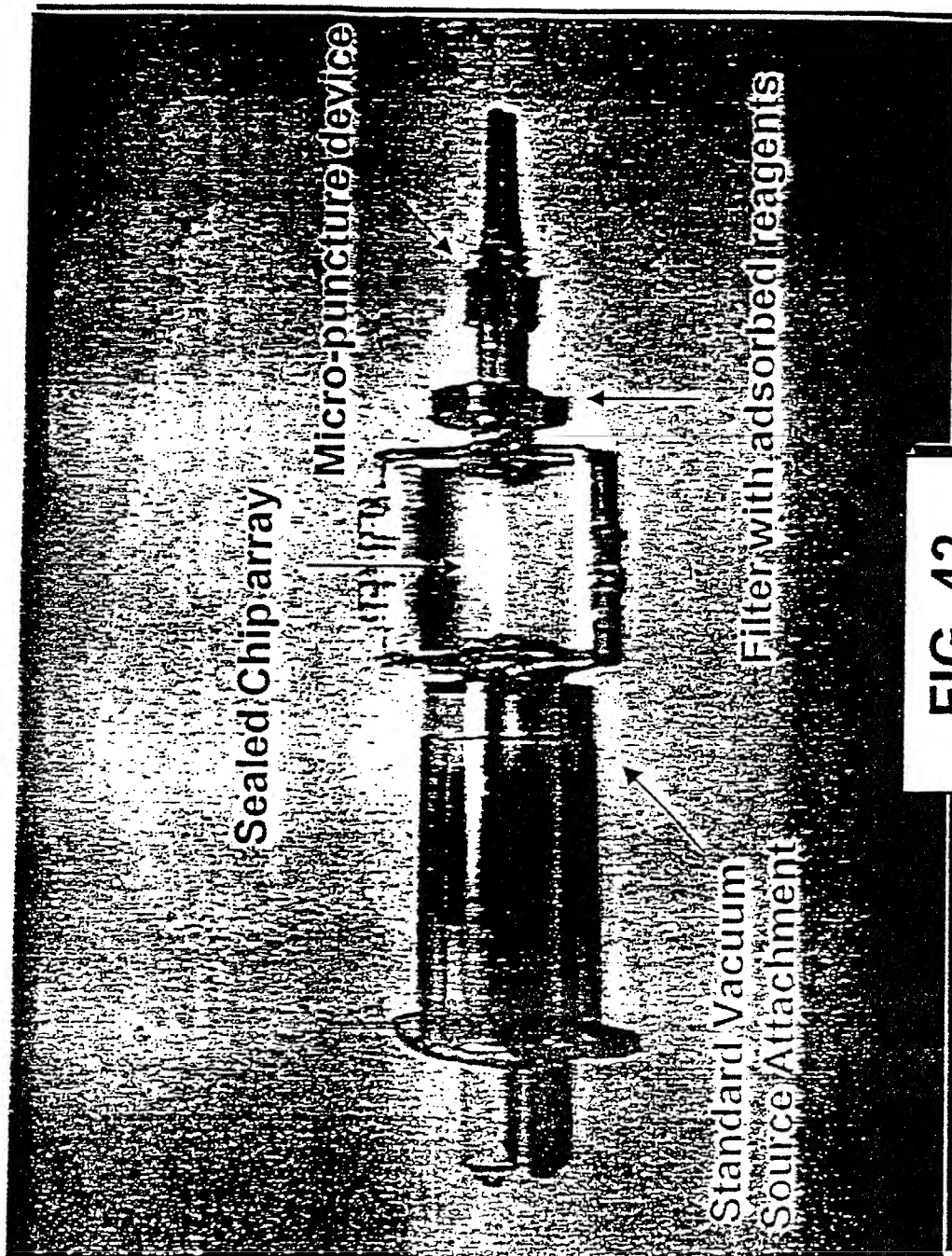
FIG. 42

Forward Flow Direction

A

B

C

D

FIG. 43

Reverse Flow Direction

FIG. 44
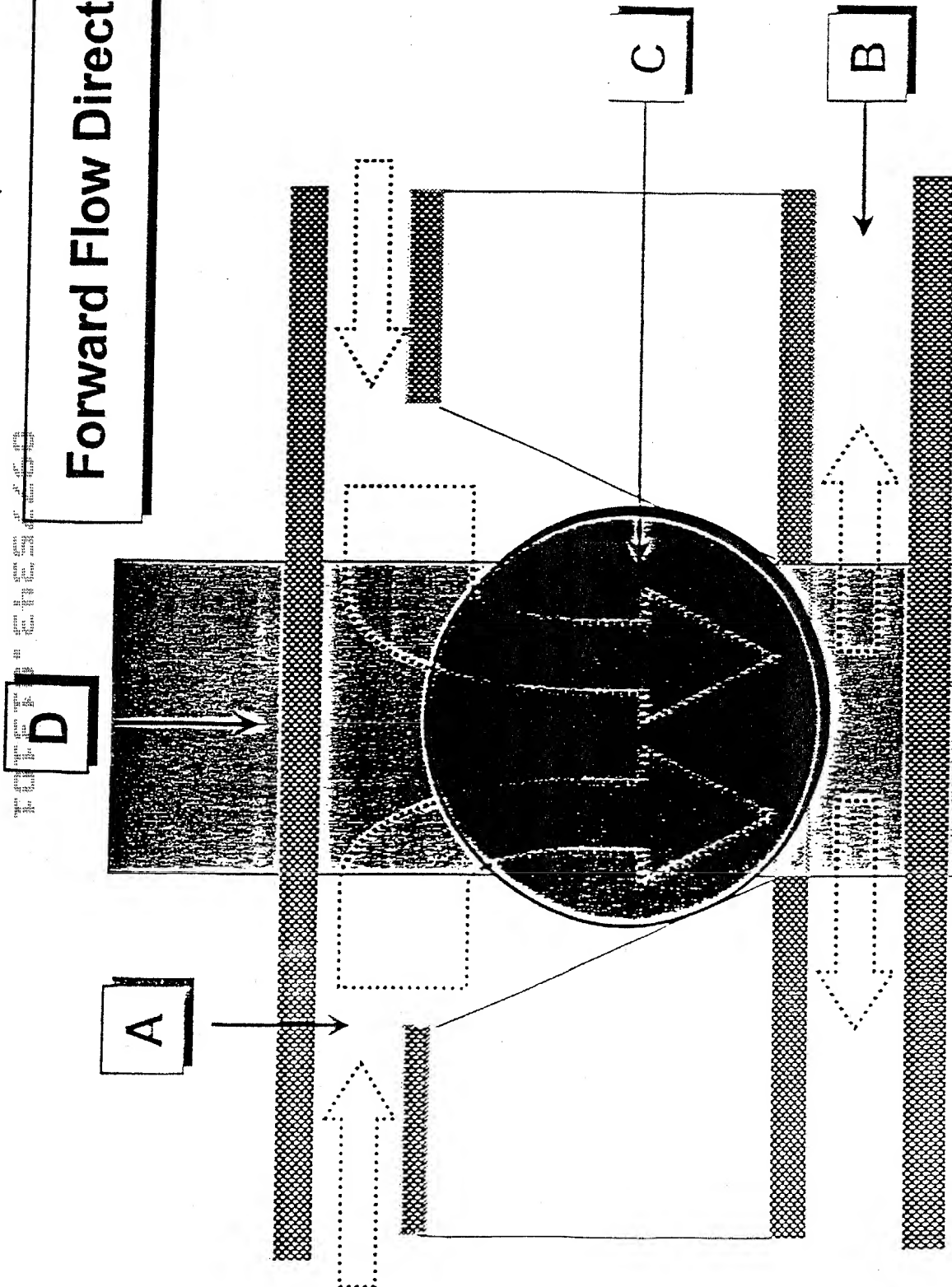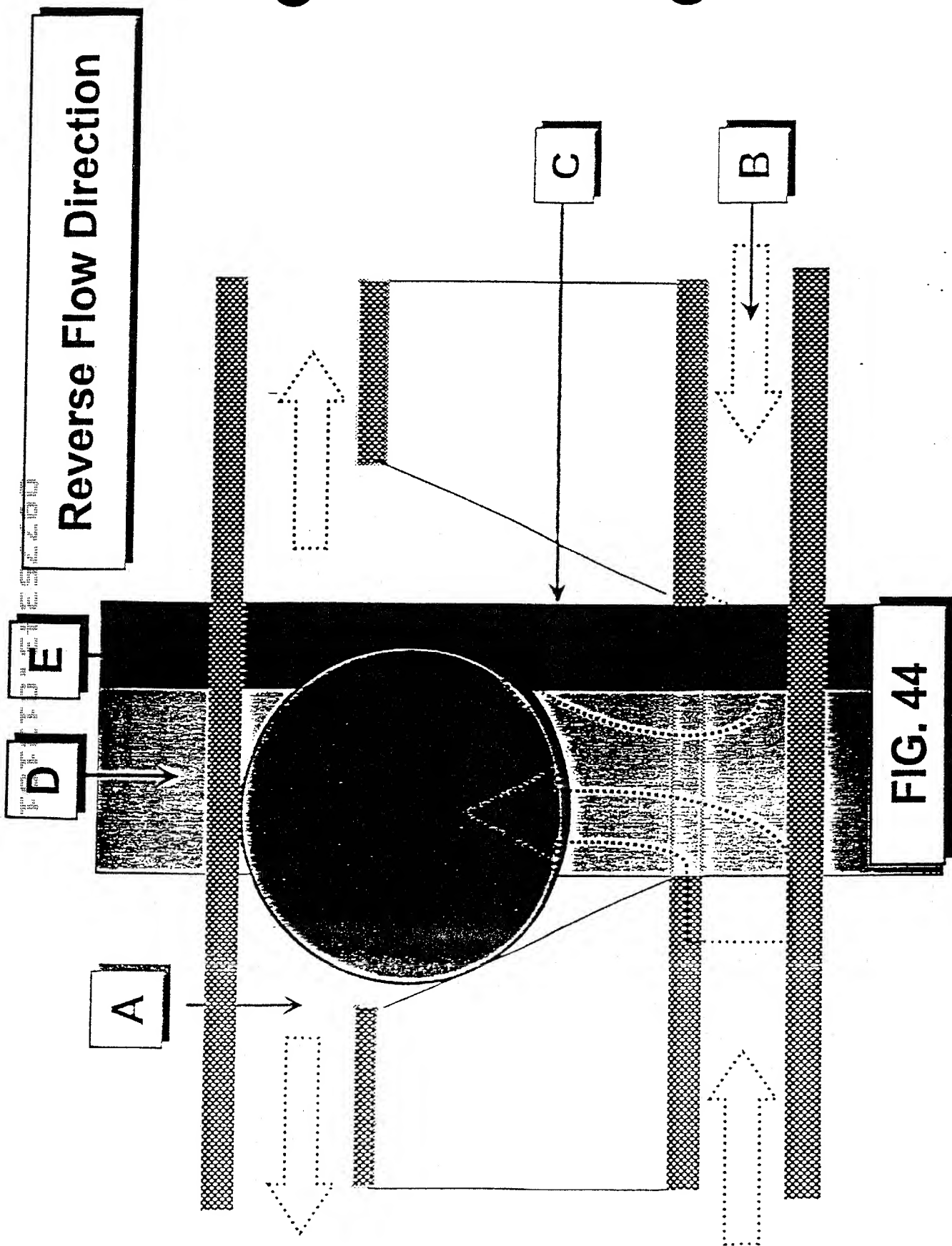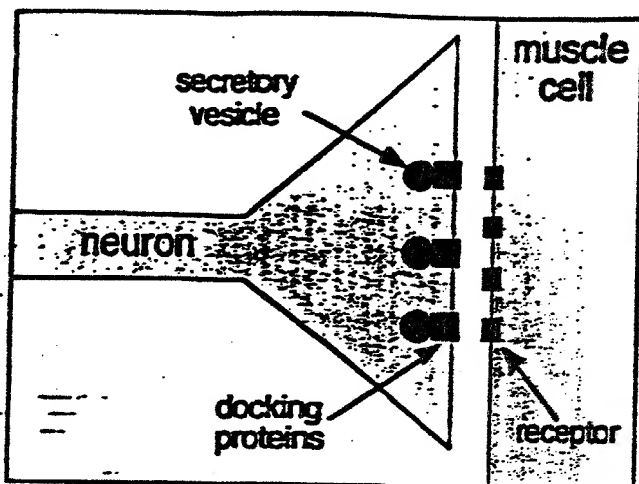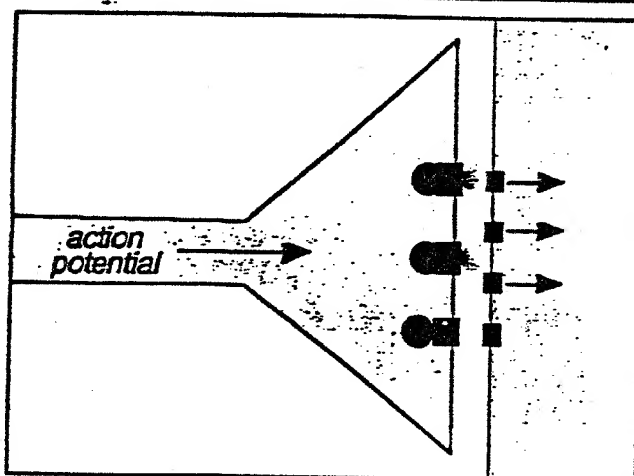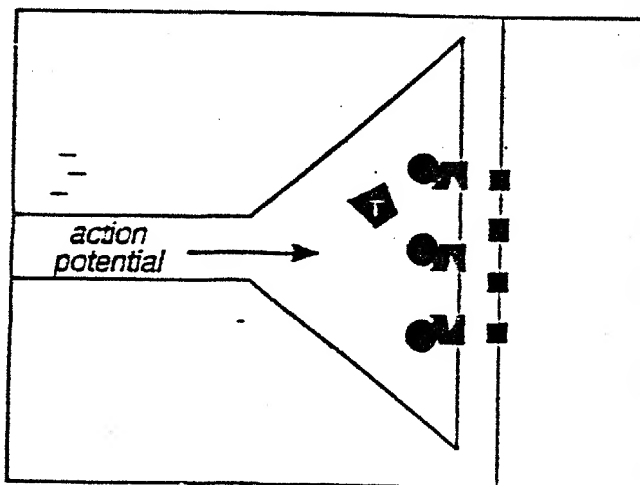
Fig. 45-A

Fig. 45-B

Fig. 45-C

FIG. 45 D

FIG. 46

FIG. 47

green to brown

blue to black

red to purple

yellow to orange

yellow to red to blue
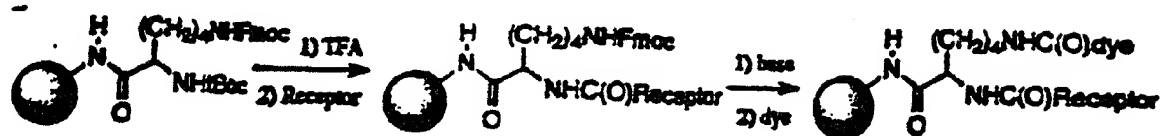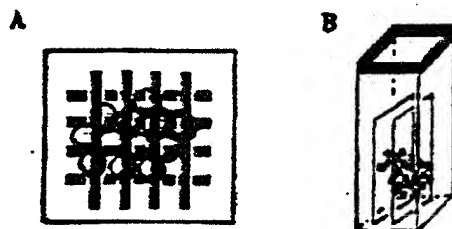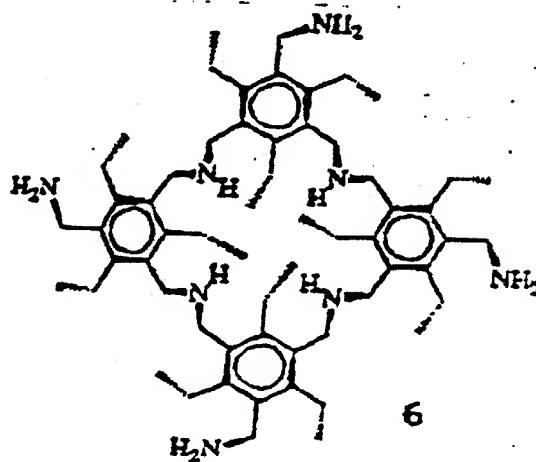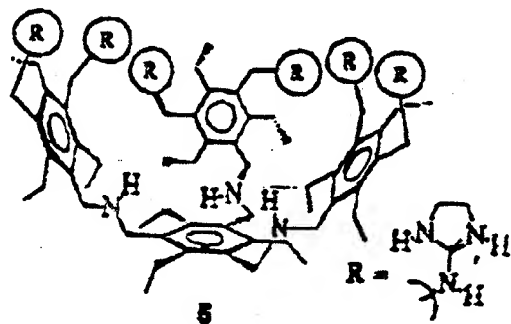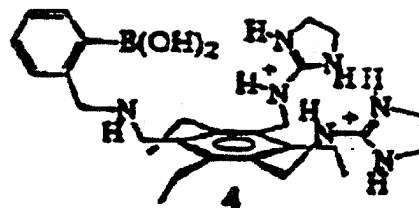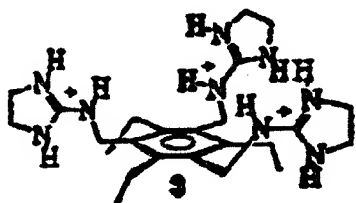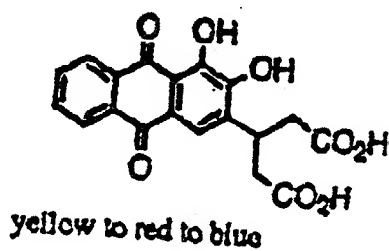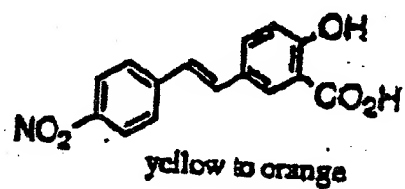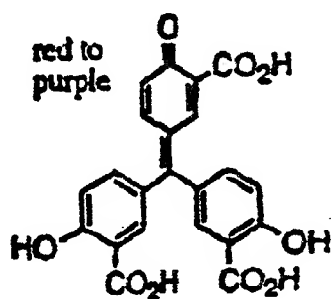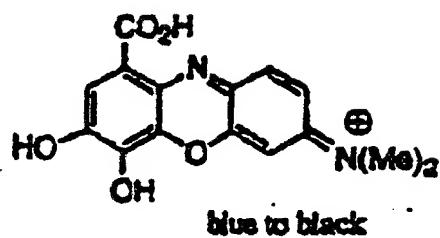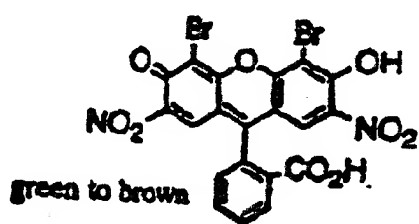
FIG. 48
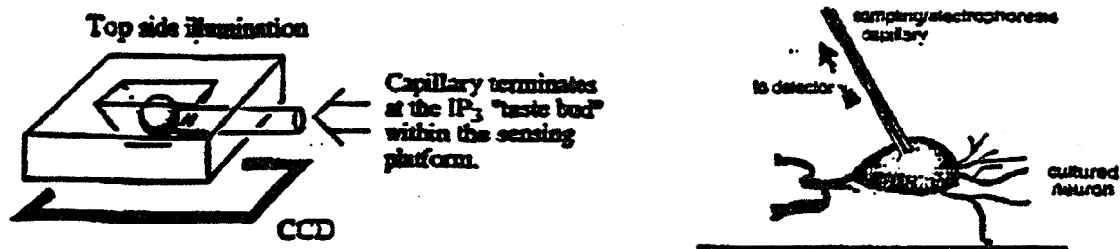
FIG. 49
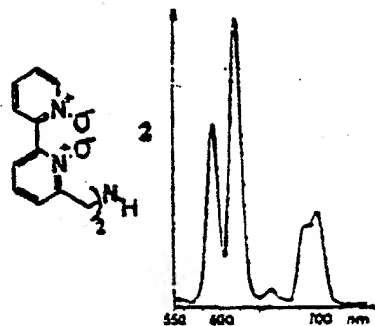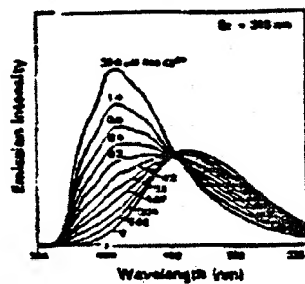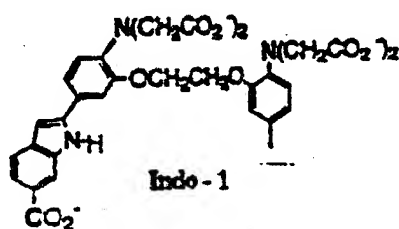
FIG. 50
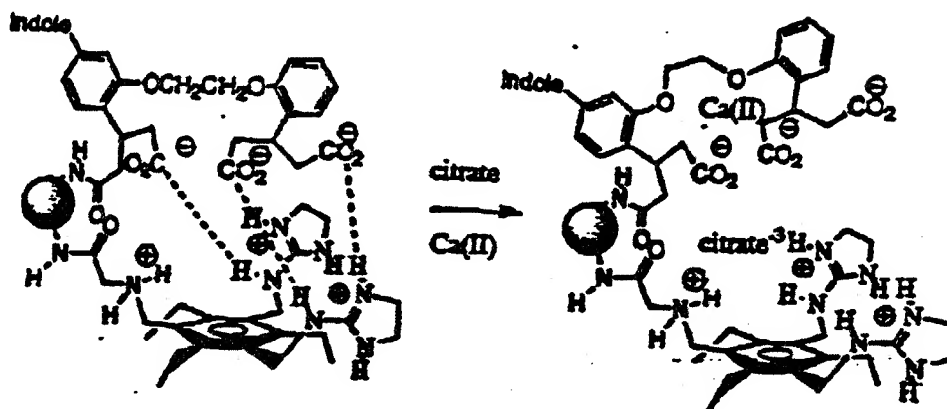
FIG. 51
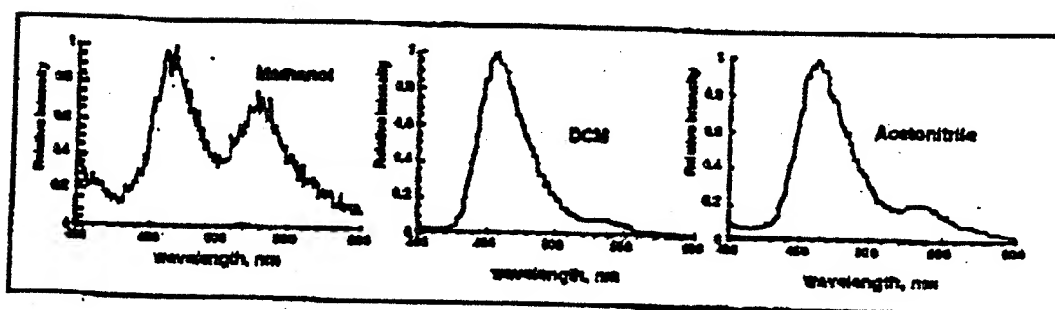
FIG. 52
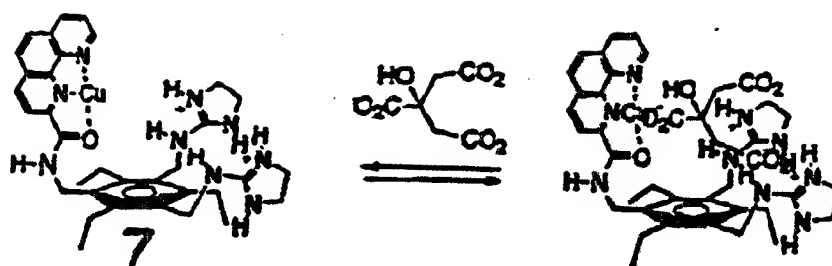
FIG. 53
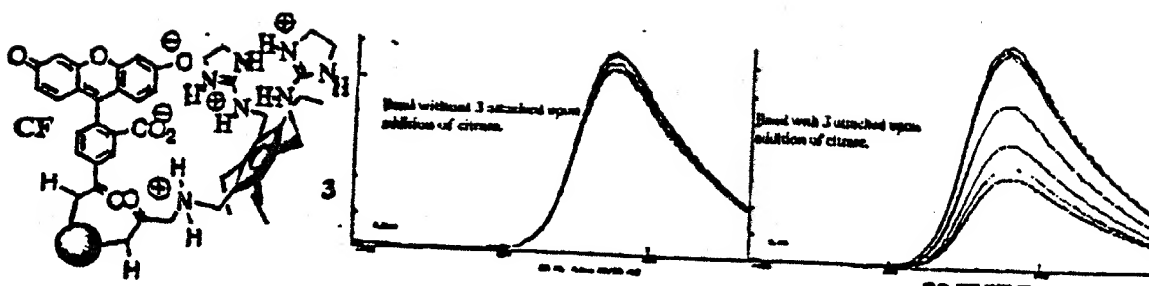
FIG. 54
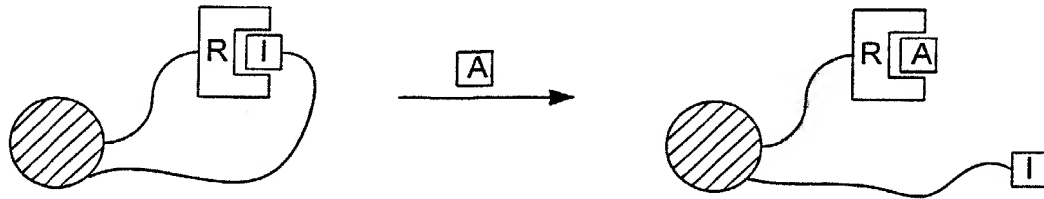
FIG. 55A
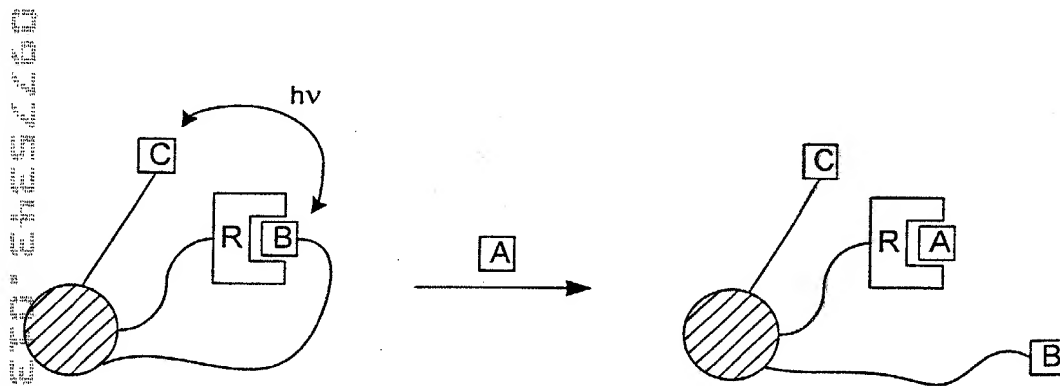
FIG. 55B
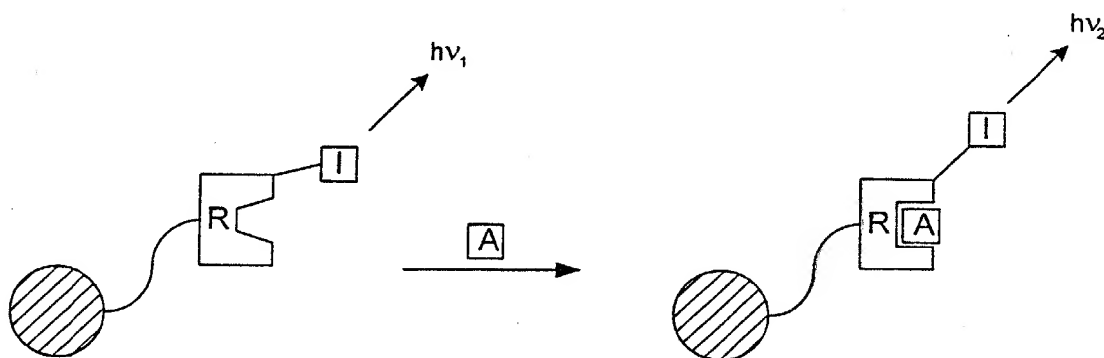
FIG. 55C
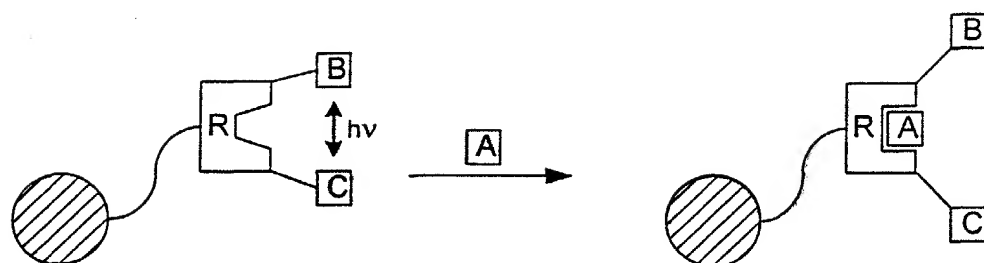
FIG. 55D
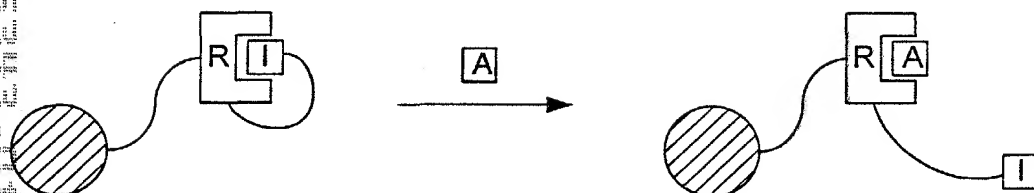
FIG. 55E
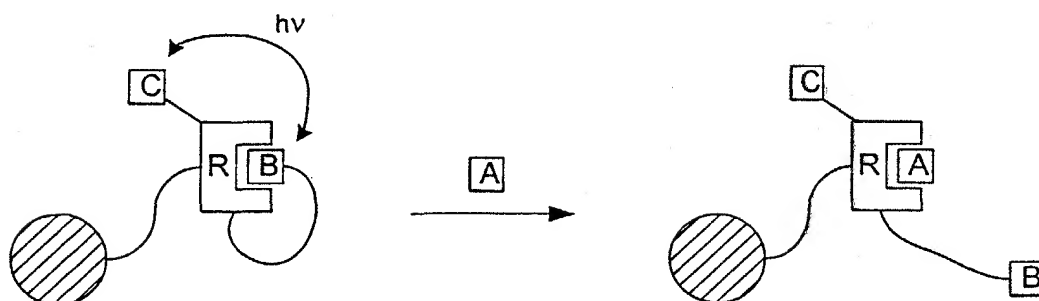
FIG. 55F

FIG. 55G

FIG. 55H

FIG. 55I

Coumarin

Trimer

Fluorescein

Resin

1

FIG. 56

FIG. 57

FIG. 58

Coumarin

2 R=

5 R=

Dansyl

3 R=

6 R=

Dapoxyl

4 R=

7 R=

FIG. 59

FIG. 60

1

Tentagel base

Guanidinium for anion recognition

PEG-NH

Tripeptide arm for selectivity

Fluorophore attachment site

X₁

Fluorophore attachment sites
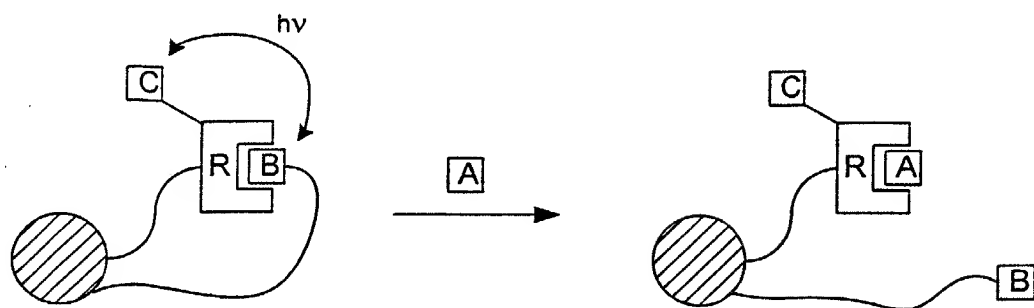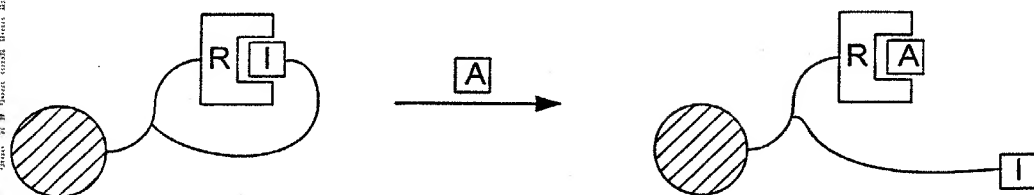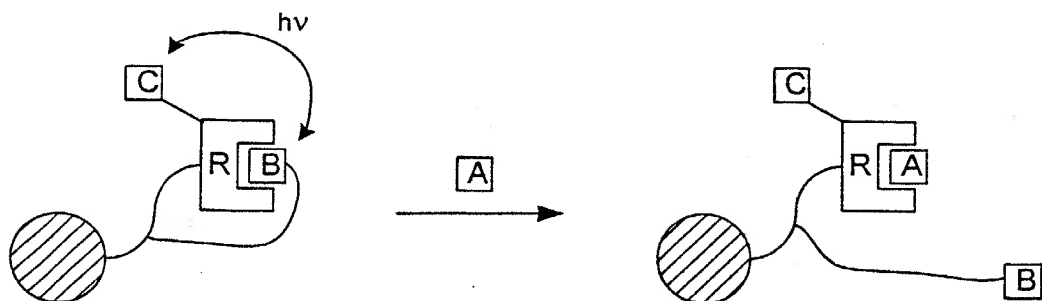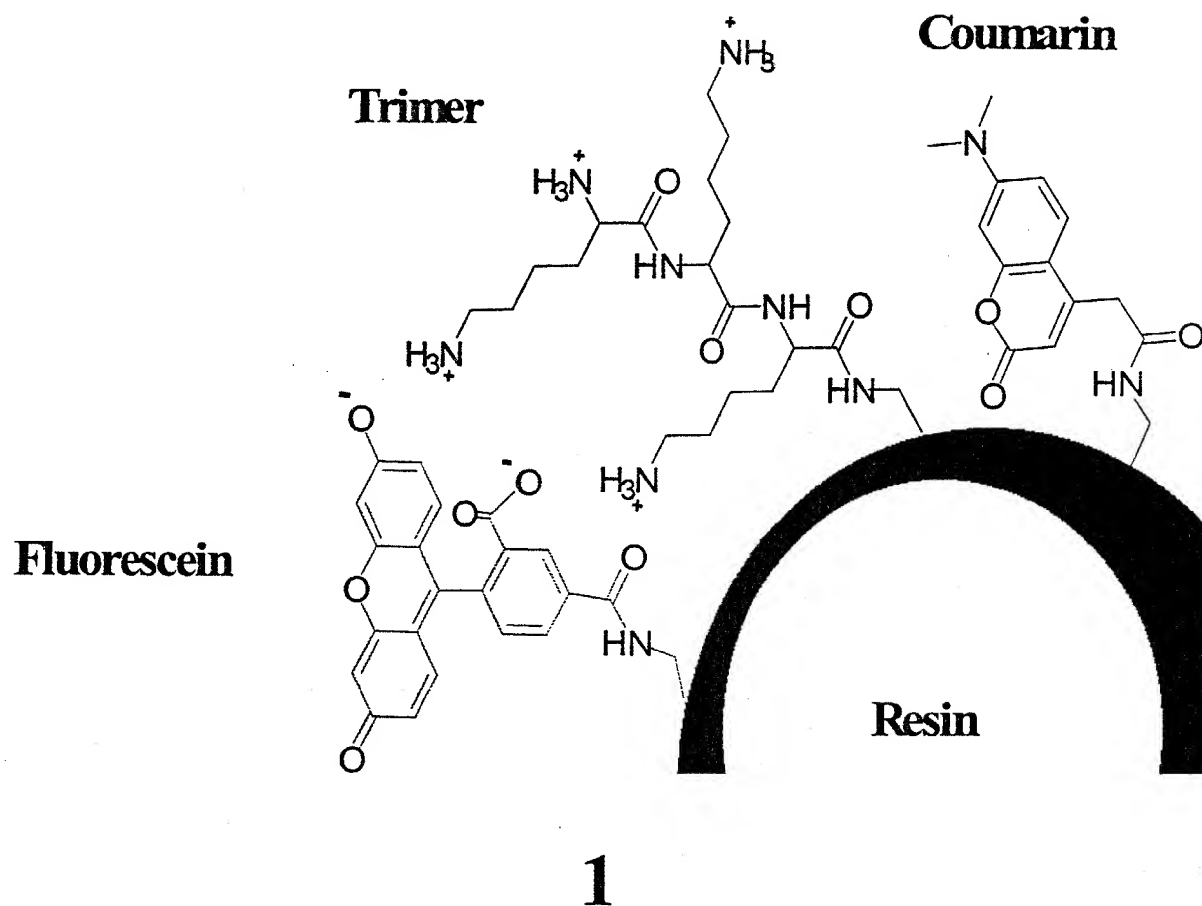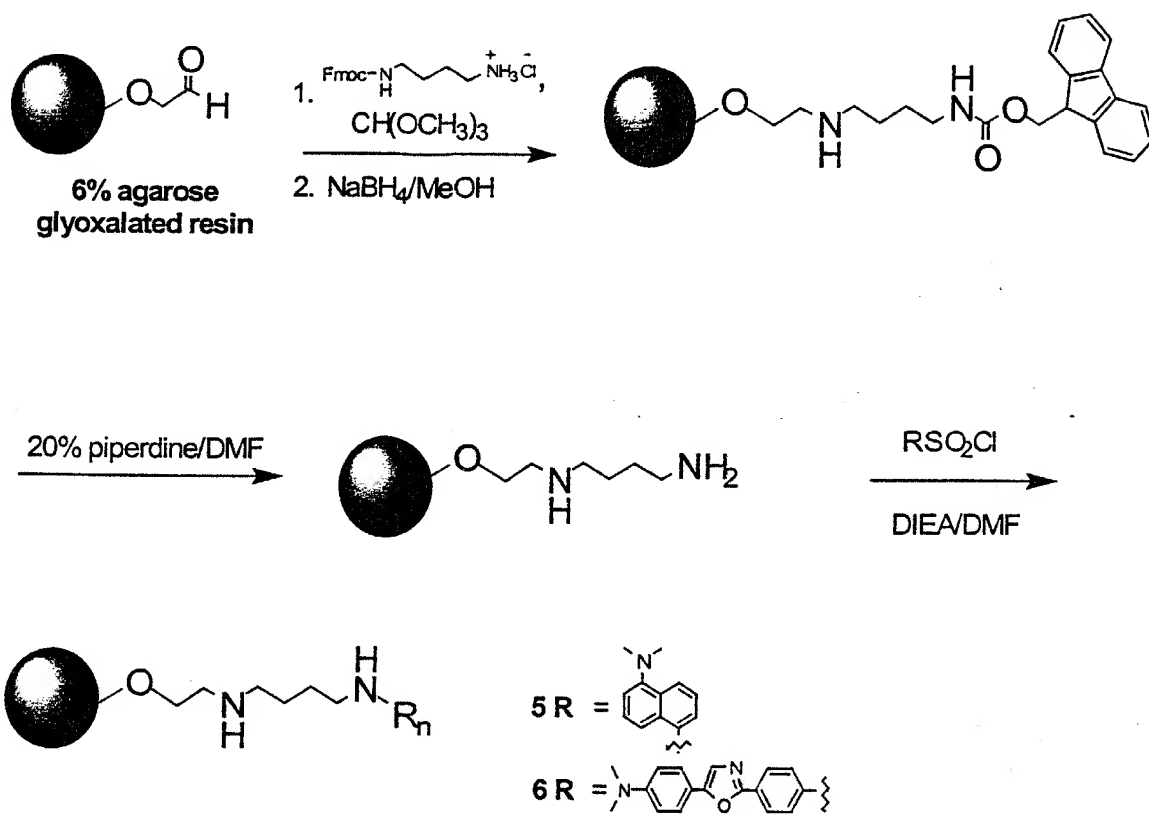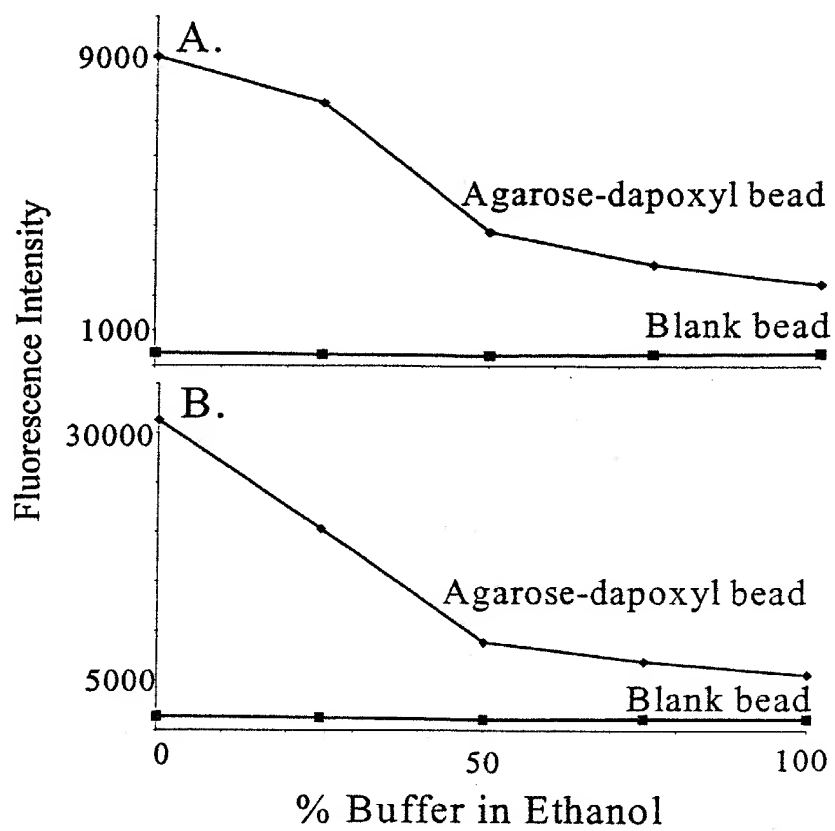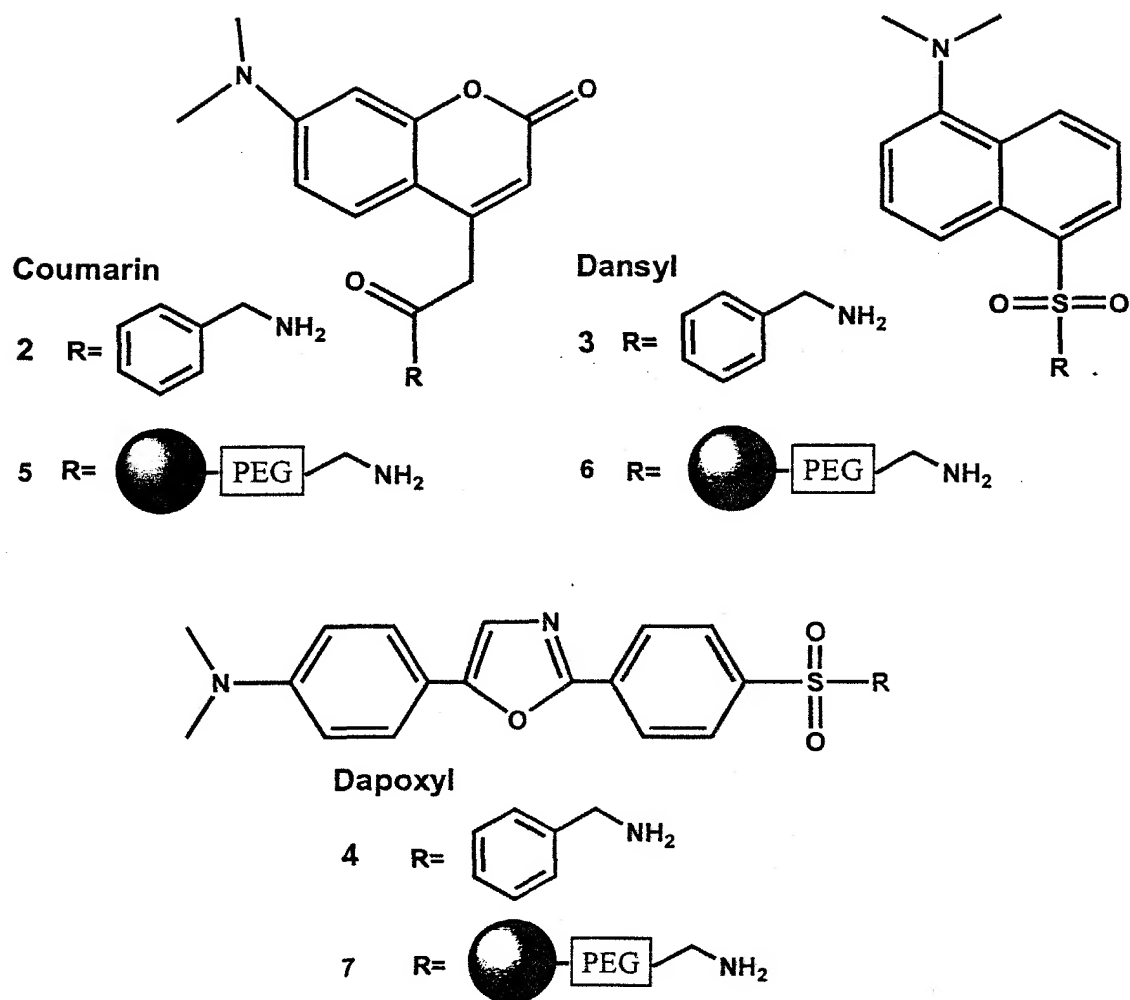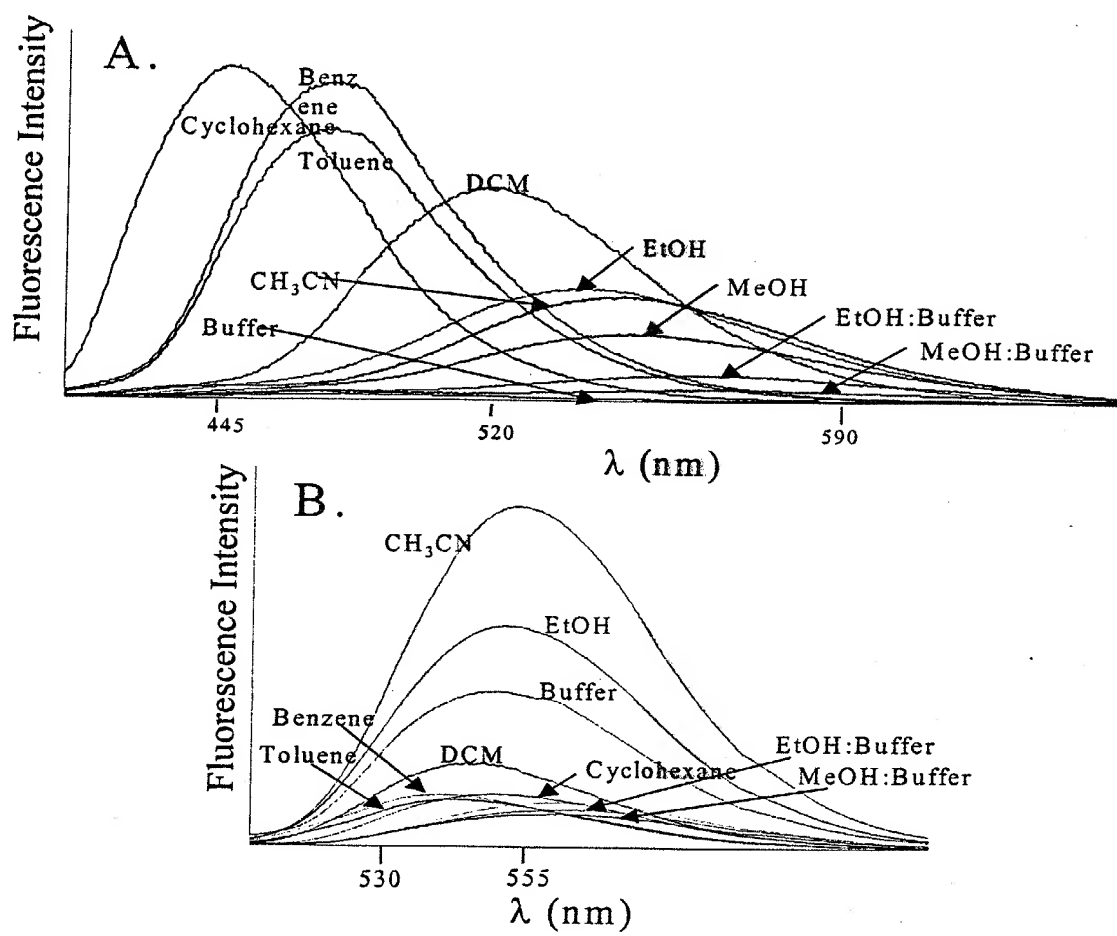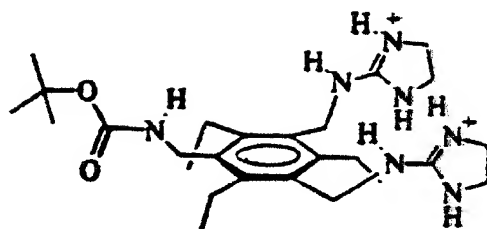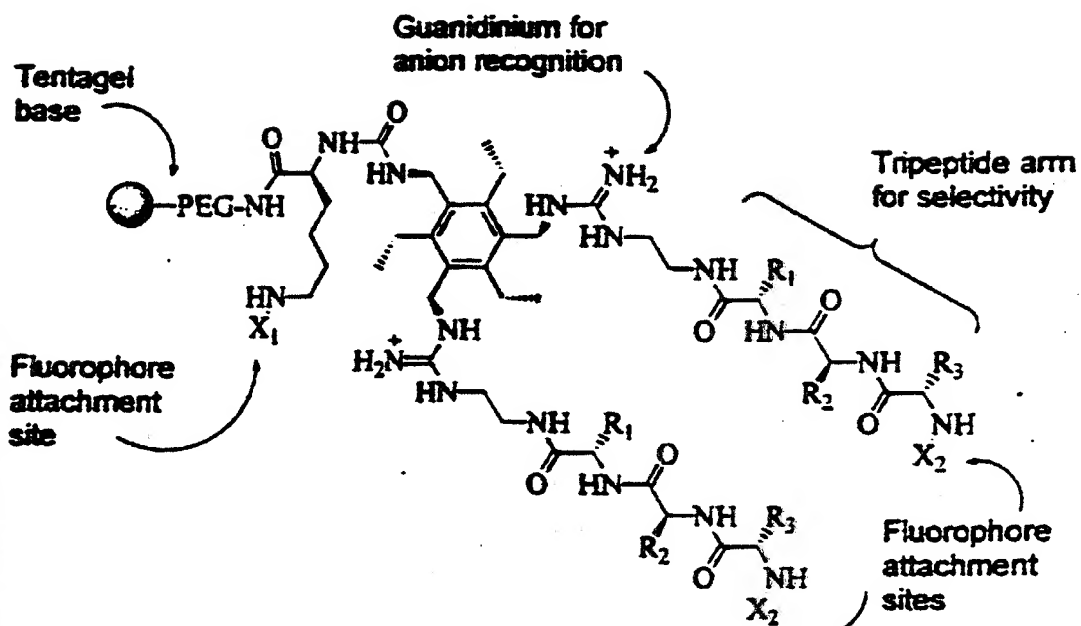
2: X₁=X₂=H   **3:** X₁=   X₂=
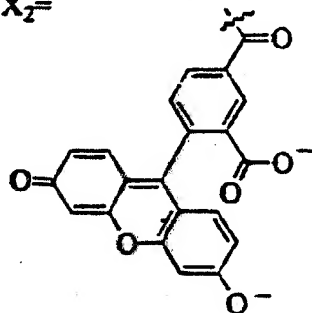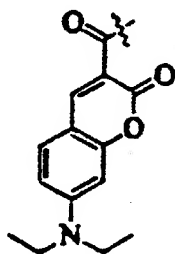
FIG. 61
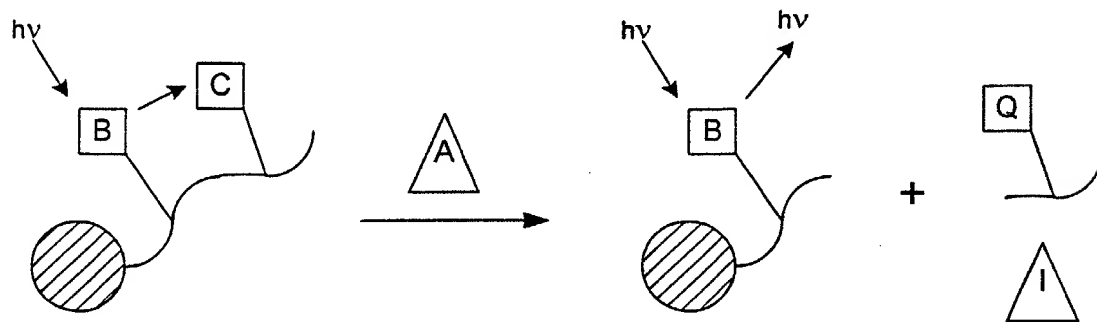
FIG. 62A
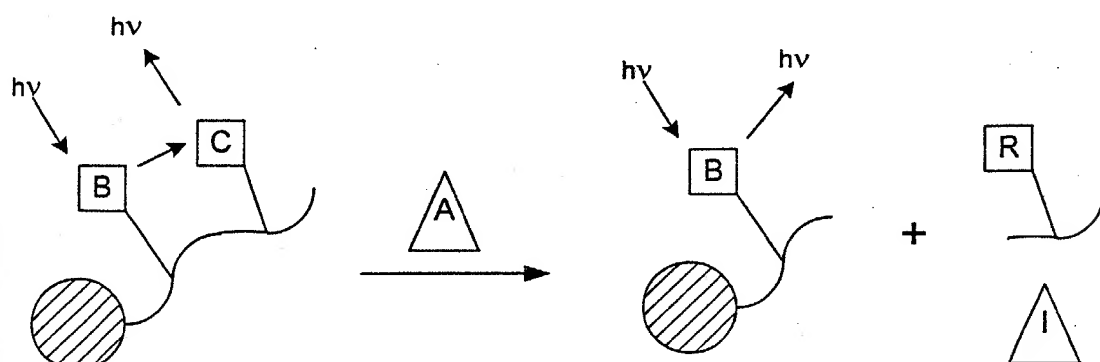
FIG. 62B

FIG. 62C

FIG. 62D

FIG. 63

Receiver
107

Client
106

Network
104

ADD
102

FIG. 64

```
Collect Chemical Information
Using An Analyte Detection
Device (ADD)
110
```

```
Transmit Chemical
Information Over Network To
Client Computer System
114
```

```
Optionally Transmit
Response Information Over
Network From Client
Computer System Back to
ADD Or Other Receiving
Computer System
116
```

FIG. ~~66~~ 65

Receiver
107

Local Computer
108

Network
104

Client
106

ADD
102

FIG. 66

```
┌─────────────────────────┐
│  Collect Chemical Information │
│  Using An Analyte Detection  │
│         Device               │
│          210                 │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│  Upload Chemical Information │
│  To Local Computer System   │
│           212               │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│    Transmit Chemical        │
│  Information Over Network To │
│   Client Computer System    │
│           214               │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│    Optionally Transmit      │
│  Response Information Over   │
│    Network from Client      │
│  Computer System Back To    │
│  Local Computer System Or   │
│  Other Receiving Computer   │
│         System              │
│           216               │
└─────────────────────────┘
```

FIG. 67

Receiver
107

Client
106

Server
302

Network
104

ADD
102

FIG. 68

Collect Chemical Information
Using An Analyte Detection
Device
310

↓

Upload Chemical Information
To Server
312

↓

Client Computer System
Connects to Server Over
Network
314

↓

Server Transmits Chemical
Information to Client
Computer System
316

↓

Optionally Transmit
Response Information Over
Network From Client
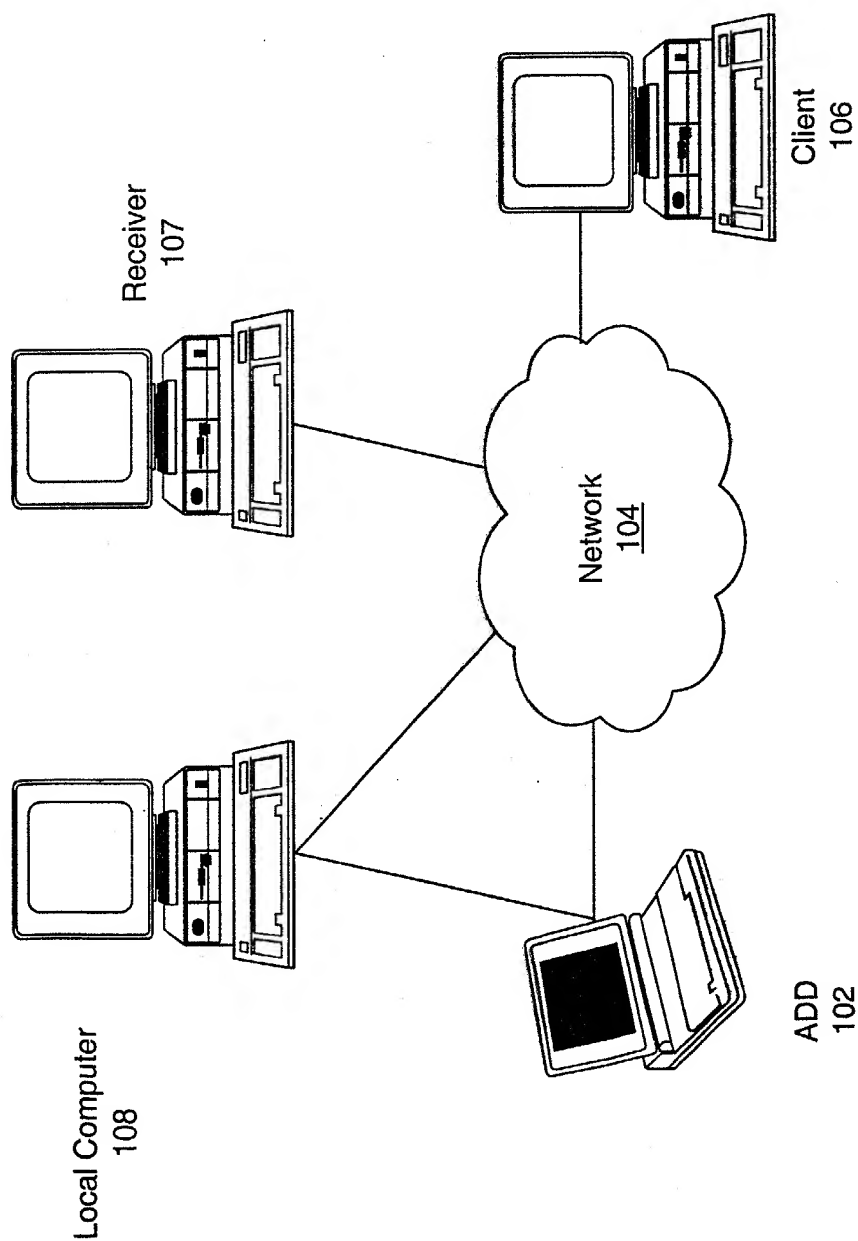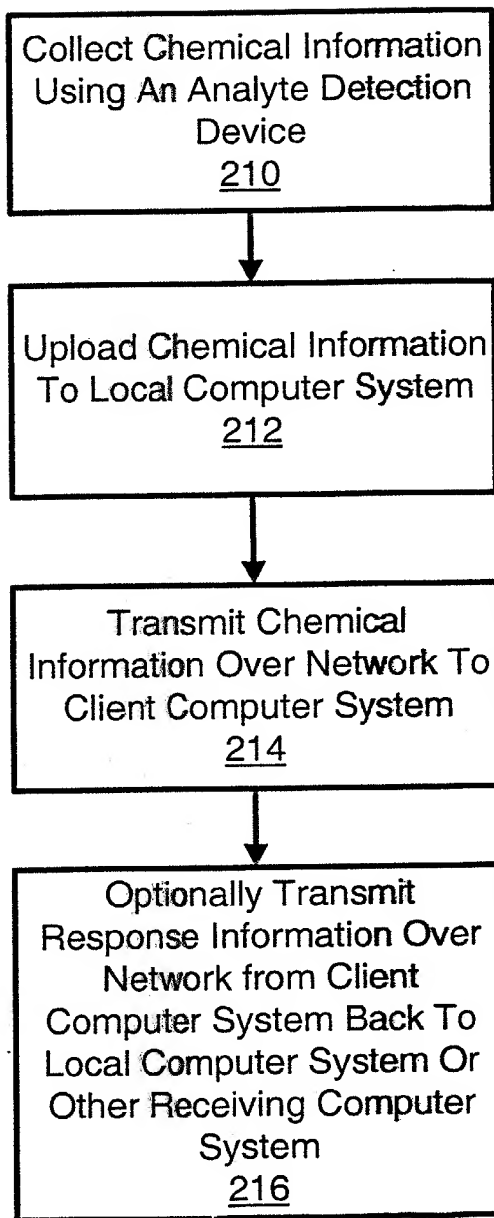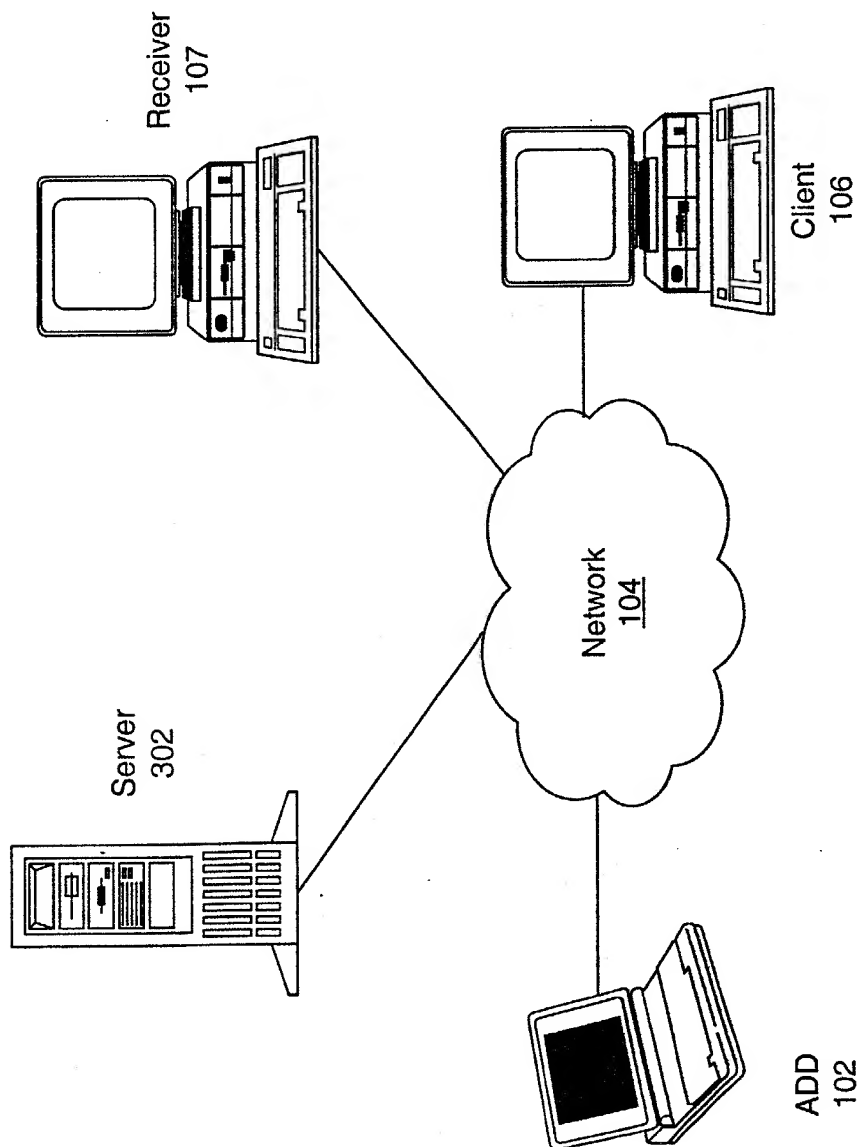Computer System Back To
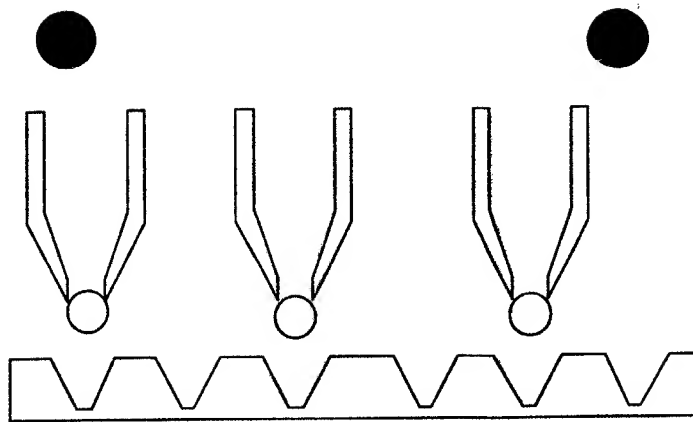Server Or Other Receiving
Computer system
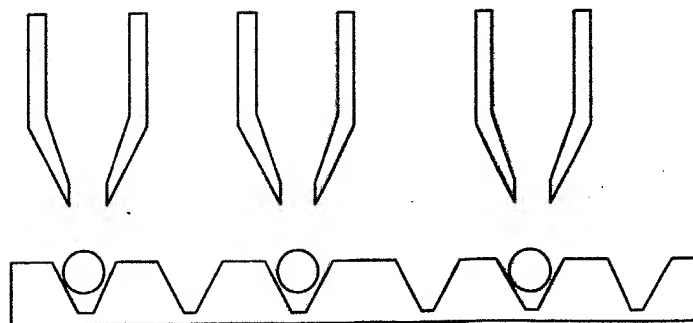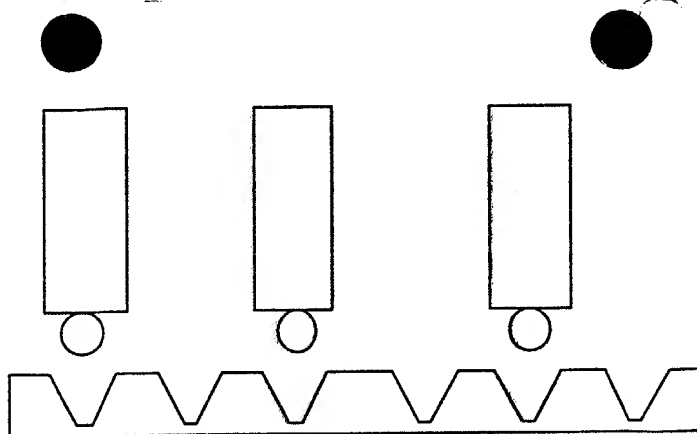318

FIG. 69

FIG. ~~52A~~ 70A

FIG. ~~52B~~ 70B

FIG. 5 71A

FIG. 5 71B

head placement

incoming substrate

vacuum chuck

air flow

FIG. 72A

bead dispense

vacuum chuck

FIG. 72B

head translation

excess bead removal

air jet

vacuum chuck

FIG. 592 72C

head placement
and repeat

vacuum chuck

FIG. 590 72D

FIG. 47 73

FIG. 53A
74

FIG. 53B
74

FIG. 39A
75

1052

FIG. 39B
75

1033

1031

FIG. 39C
75

FIG. 39D
75

FIG. 76

FIG. 77

1030

1040

1022

1020

1014

1010

1012

1050

1050

FIG. 78

1110

1120

FIG. ~~55A~~ 79A

1130

1120

1150

1140

FIG. ~~55B~~ 79B

FIG. 80

FIG. 81

1282
1290
1210
1284
1285
1287
1286
1280
1283

Figure 82